MACHINE and TOOL ENGINEERING

JANUARY 1943

The TOOL ENGINEER

Official Publication of the American Society of Tool Engineers

For a Better World
THE rumble of tanks, zooming of planes, crack of rifles, roar of cannon, bursting of bombs, are largely dependent upon machine tool operation in our war industries. It is a satisfaction to know that our New Britain Automatics, with their astounding capacity for unprecedented production, are enabling more and more industries throughout America to produce the sinews of war in greater abundance, with greater speed for our men on the fighting fronts — for a better world to come.
NEW ★ BRITAIN ★ AUTOMATICS
NEW BRITAIN-GRIDLEY MACHINE DIVISION
The New Britain Machine Co.
New Britain, Conn.

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P&W Photo—Unretouched

but with this difference

This is a taper cutter in the making . . . getting its teeth milled . . . here acquiring what we call "backing off." The angles on these teeth are tremendously important for strength, chip clearance and smooth, accurate cutting ability. Yet you never need worry about them . . . that's our job. We've spent long hours finding out what they should be . . . and we give you the right cutters to do your job.

If you have this P&W taper cutter — or any other P&W small tools, machine tools, or gages — note this: *war production is burdening P&W products with more high-speed, unrelenting work than their purchasers ever expected . . . yet P&W products are standing up in this ordeal, delivering all the accuracy of finished work always associated with this superior line.*

Don't let undue concern for your P&W equipment stand in the way of all-out production. *Don't spare the pressure . . . your P&W tools can take it.*

PRATT & WHITNEY

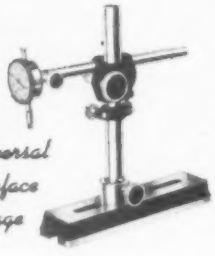
Division Niles-Bement-Pond Company

WEST HARTFORD • CONNECTICUT

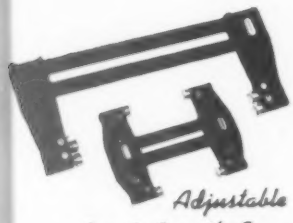
STANDARD Gages

Dial Bore Gage

Snap Gage

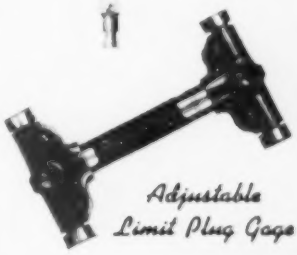


Universal Surface Gage



Adjustable Limit Length Gage

Test Indicator



Adjustable Limit Plug Gage

Cylindrical Ring Gage

Depth Gage

Dial Pin Gage

Master Disc

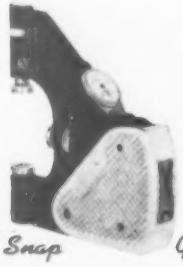
Special Gage

Adjustable Limit Pin Gage

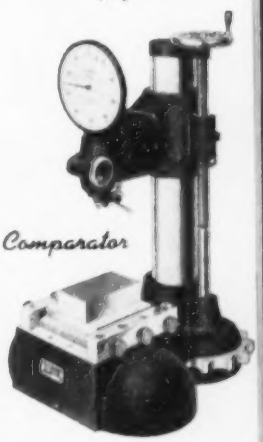
Dial Indicator

Cylindrical Plug Gage

Dial Plug Gage



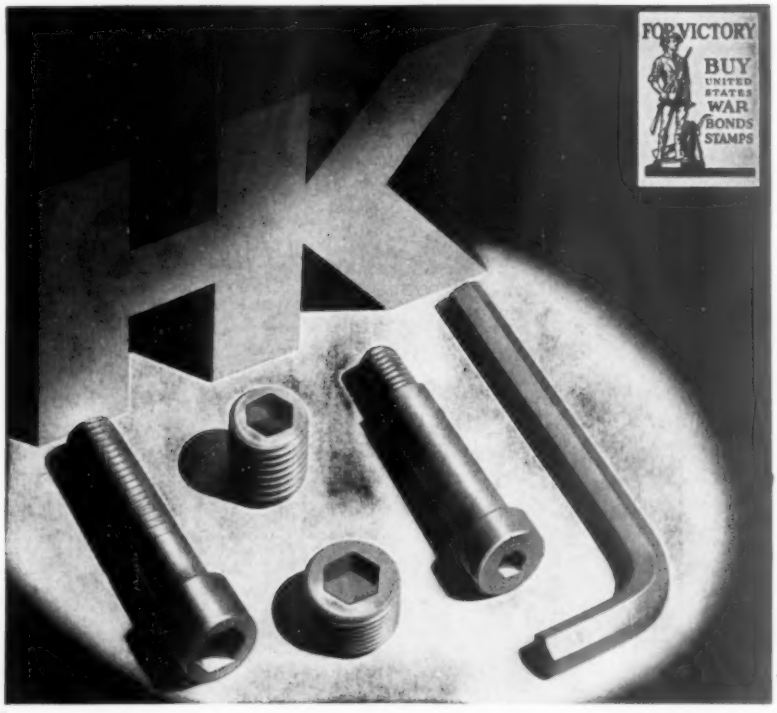
Dial Snap Gage



Comparator

STANDARD GAGE CO. INC —— POUGHKEEPSIE N.Y.

Completely Cold Forged



HOLO-KROME
FIBRO FORGED SOCKET SCREWS

are COMPLETELY COLD FORGED by a method patented and exclusively used by HOLO-KROME in the manufacture of these PRECISION MADE SCREWS.

GUARANTEED Unfailing PERFORMANCE

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THE TOOL ENGINEER

Volume XII JANUARY, 1943 Number 1

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O.W.I. Photo by Palmer

● Back of successful machine and tooling operations, inspection set-ups, tool control and materials-use are thought and planning "on the board." Outstanding board work is featured in a variety of practical articles in this issue. Line drawings and charts save much ground work in direct application, or in converting ideas to particular production problems.

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National Business Papers Assn.

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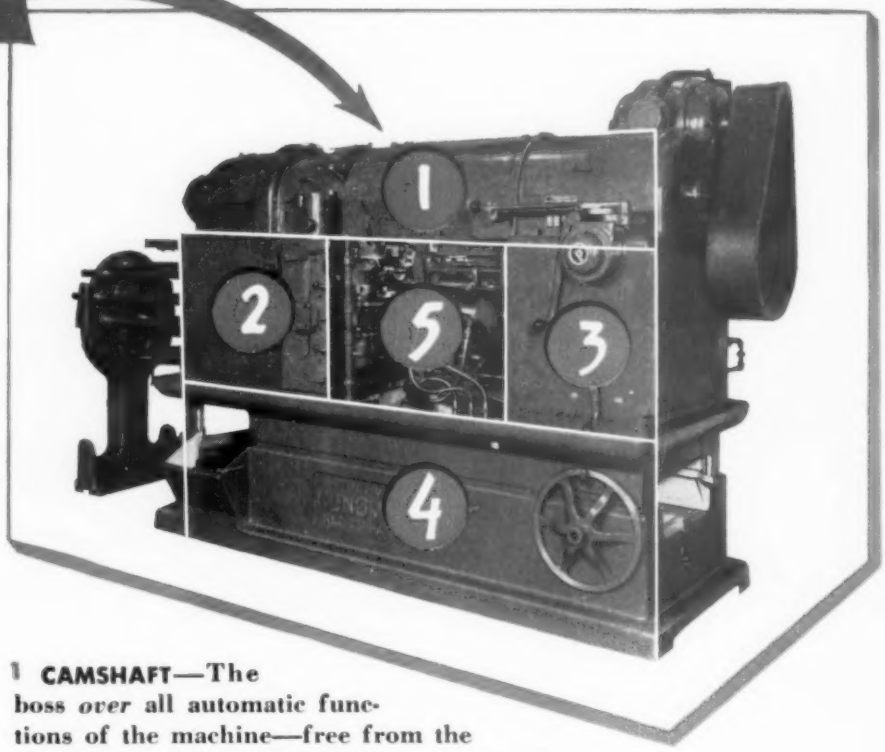
Boss OVER 5 ORDERLY DEPARTMENTS



1 **CAMSHAFT**—The boss *over* all automatic functions of the machine—free from the interference of coolant, falling chips and dirt, yet easily accessible for quick cam changes.

2 **WORK HEAD**—Rigid, compact unit for spindle carrier and cross-slide support.

3 **GEAR BOX**—Large, right end support housing the accessible speed and feed change gears.

4 **BASE**—Rugged—roomy for chips and coolant reservoir.

5 **PRODUCTION AREA**—Spacious and convenient—where departmental arrangement proves its value in accurate, quality work.

Conomatic design has always been appreciated by the production man and experienced operator—it is of vital importance in training new operators.

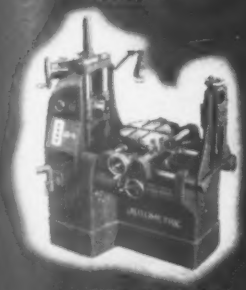
Write, wire, or phone for further information.

CONE

AUTOMATIC MACHINE CO., INC.
WINDSOR, VERMONT
U. S. A.

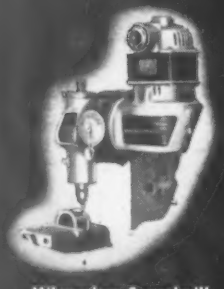
and Attachments for a Wide Variety of Needs:

Rotary Head Milling Machine

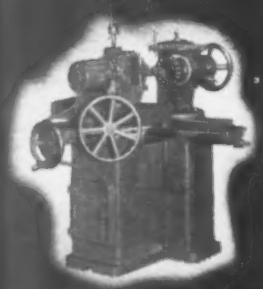


Autometric Jig Boring Machine

Milwaukee Midgetmill



Milwaukee Speedmill



Milwaukee Face Mill Grinder

Center Scope

CENTER SCOPE, the optical locating tool, makes accuracy a habit regardless of who uses it . . . It locates edges on layouts to "within a tenth" — does it fast — and the operator can see that he is right!

The Center Scope can be used on any machine tool and provides an easy method to compensate for spindle or adaptor run-out.

It is a precision instrument not affected by wear, temperature or mechanical pressure. In addition to its many advantages, it is attractively priced. You can get your Variable Center Scope for only $97 f.o.b. Los Angeles, Calif.; Edge Block is $23 additional. Other models slightly higher.

For further details write for Bulletin No. 201-A.

Buy Victory with at least 10% in War Bonds!

Kearney & Trecker
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MILWAUKEE, WISCONSIN
Subsidiary of Kearney & Trecker Corporation

DIVING SPEEDS require *Extra Safety*

. . . as with

MICROHONING

When *diving motors* "rev" up to 5600 r.p.m., the entire success of a mission may depend upon having an extra margin of safety in critical bearing surfaces. These surfaces are not completely safe unless extremely accurate, and "structurally perfect"—entirely free of microscopic cracks and disturbed subsurface material which induce fatigue failure.

MICROFINISH HONING is providing such surface quality in regular high production because—

It does not generate injurious frictional heat—hence avoids cracks.

It does not disturb or weaken subsurface material.

It corrects error and generates accuracy.

It generates any desired type or degree of controlled surface finish smoothness.

It provides all these advantages under the control of a single process.

Write for Bulletin A. R. 67

Micromatic
HONE CORPORATION
DETROIT, MICHIGAN
Manufacturers of Honing Machine Tools

MICROHONING
is used to finish

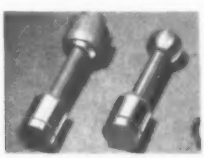
Gun Barrels—before and after rifling—diameters .303" to 18" and lengths up to 75 feet • Gun Recuperators and Engine Cylinders • Wrist Pins • Valve Guides • Con Rods • Bearings • Pneumatic and Hydraulic Cylinders—and many other precision parts for ordnance, aircraft, automotive equipment, tanks, machine tools, etc.

Phone
DETROIT
TRINITY
1-1300

MICROHONING *is now used to generate finished surfaces in many parts—in bores, on shafts, pins, etc.*

SAVE TIME
SAVE METAL
SAVE COST
IMPROVE QUALITY

ENGINES • Honing Valve Guides after assembly in crankcase (Radial Aircraft Engine) on double-end Hydrohoner with Microsize Control. Production—3 to 6 complete assemblies per hour—removes average of .0005″ to .001″—generates uniform size within .0003″ to .0005″, accuracy within .0001″ to .0003″, and surface finish within 3 to 5 microinches r.m.s.

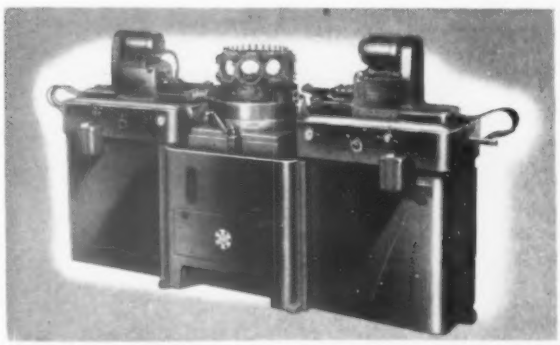


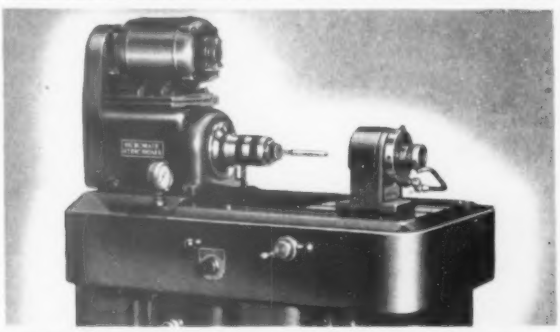
HYDRAULICS • Honing O.D. of pistons for a variable delivery hydraulic pump —with the unusual feature that half the piston surface area is hardened, half is soft.

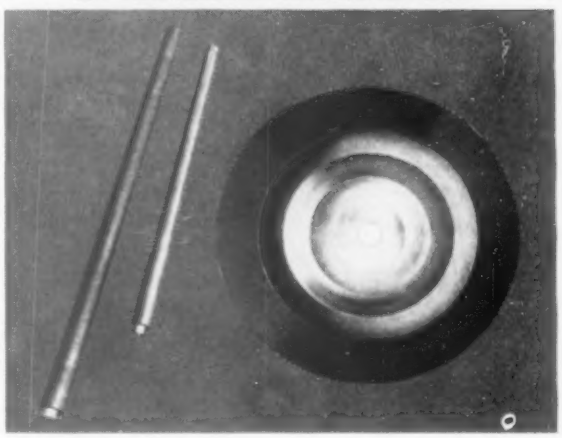
ORDNANCE • Typical gun barrels regularly honed in production include 50-caliber machine guns—20-millimeter cannon as well as other and larger calibers up to and including 16″ and 18″, and from 30 inches to 75 feet in length.

External honing of recoil piston rods generates accuracy within .0001″ to .0003″ and any desirable finish.

Internal honing of recoil cylinders generates round and straight accuracy within .0005″ to .0007″—and the exceptional "co-directional" draw-finish demanded by such service.

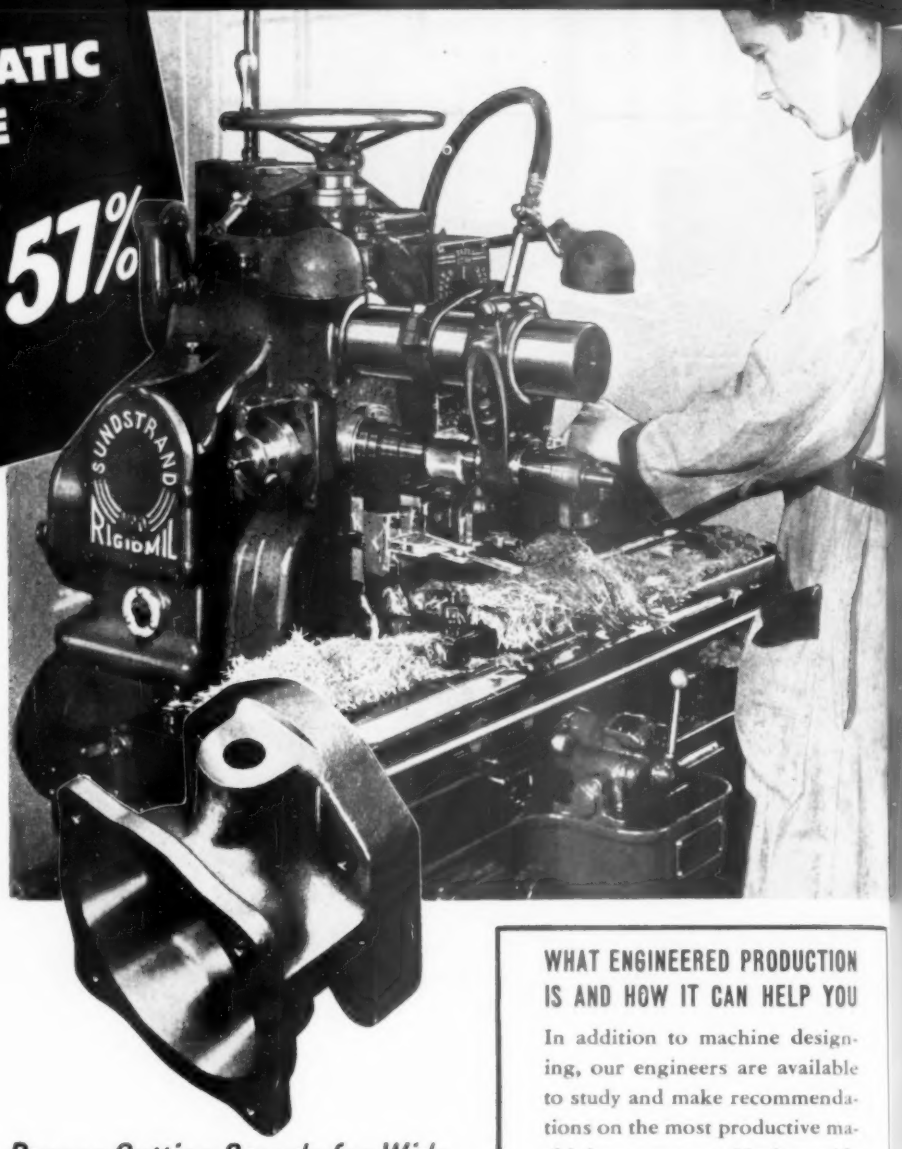






TWO-WAY AUTOMATIC MILLING CYCLE

Increases Production 57%



37 more parts per hour ...loading and unloading done while cutting

This prominent manufacturer of airplane propeller governors formerly milled the relief valve boss of the governor body one at a time. With the installation of a Sundstrand No. 0 Hydraulic Rigidmil, *with automatic cycle,* he is able to utilize two fixtures on the table and mill one part while the other is being loaded. Another example of how production can be increased by a simple change in machining method—with no increase in feeds or speeds.

2-Way Automatic Table Cycle

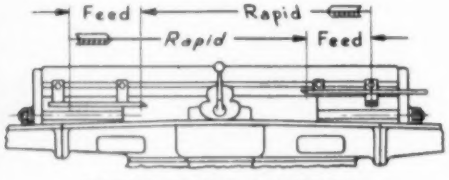


TABLE CYCLE DIAGRAM

The 2-Way Automatic Table Cycle of the No. 0 Rigidmil makes it possible to place duplicate fixtures at opposite ends of the table and to combine the operations. The hydraulic cycle rapid traverses continuously between fixtures, automatically changing to feed rate at each end of the table, as diagramed. Operator merely changes one work piece while the other is being milled.

Proper Cutting Speeds for Wide Range of Material

In addition to milling the governor body, approximately 14 other jobs are machined on this No. 0 Rigidmil. Material is either steel or aluminum and the wide spindle range of 25 to 1200 r.p.m. makes possible the use of proper speeds over a wide variety of materials. Other rigidmils available with spindle speeds from 50 to 2500 r.p.m.

Sundstrand Rigidmils may be the answer to your milling problems. Send for complete data on the entire line and let our engineers suggest the proper machine and *productive machining method* to suit your job. Write today.

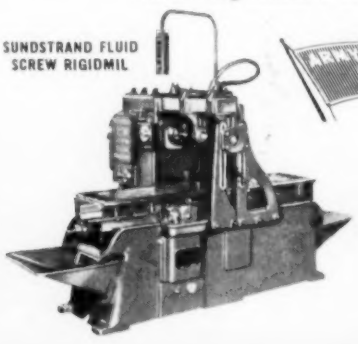
WHAT ENGINEERED PRODUCTION IS AND HOW IT CAN HELP YOU

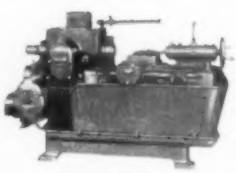
In addition to machine designing, our engineers are available to study and make recommendations on the most productive machining sequence. Having wide experience on production milling and turning operations makes it possible for our engineers to suggest changes which will increase production and lower cost. They are at your service without obligation. Use this service freely, especially on urgent war jobs. Be sure to send complete, accurate information with each inquiry.

FREE RIGIDMIL DATA:
Get the complete story on Sundstrand Standard Milling Machines. Booklets include specifications and performance data. Ask for Bulletin 808.

SUNDSTRAND RIGIDMILS... AVAILABLE IN 3 SIZES

SUNDSTRAND FLUID SCREW RIGIDMIL





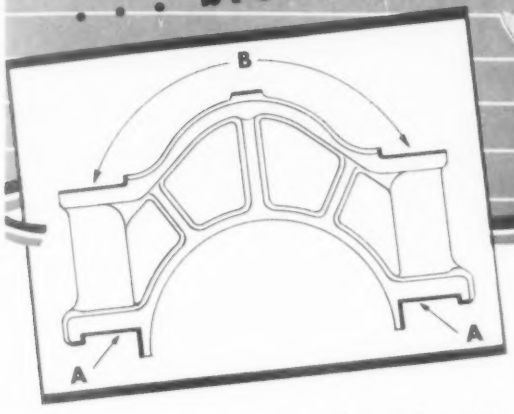
SUNDSTRAND AUTOMATIC STUB LATHES...AVAILABLE IN 3 SIZES

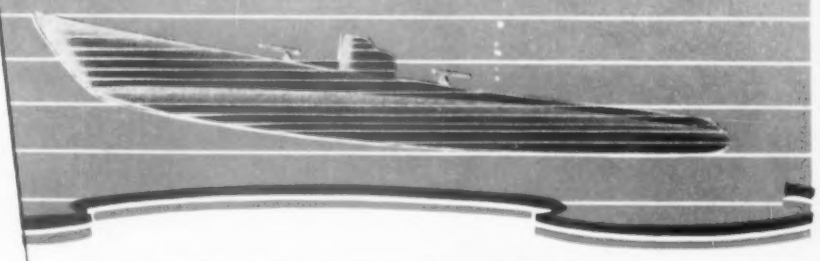
SUNDSTRAND MACHINE TOOL CO.

2530 ELEVENTH ST. ROCKFORD, ILLINOIS, U.S.A.

THIS UNUSUALLY LARGE BEARING CAP *Broached*

. . . broaches and fixtures by Detroit Broach





Here is where the accuracy and fine finish, so consistently secured by broaching, are desired more than production speed. This marine diesel engine bearing cap is broached from a rough forging that weighs forty-one pounds after broaching. Between three and four pounds of stock are removed. Yet the tolerance is held to .001″ on a 10⅛″ dimension and a good finish is obtained.

The cut was made by three broaches. The first broach roughed the surfaces marked "A" to approximate size in eight passes as the work advanced toward the tool. A finishing broach smoothed these surfaces in one pass. Another broach cut the surfaces marked "B" in one pass completing the job.

The broaches and fixtures used for this work were designed and built by the Detroit Broach Company.

DETROIT BROACH COMPANY
20201 SHERWOOD AVENUE • DETROIT, MICHIGAN

et Production ind Finish

1–Automatic Turning and Boring!

Foster Fastermatic Universal Automatic Turret Lathes are pacesetters that produce large quantities of accurately machined parts in minimum time. Feeds and speeds are automatic...the proper feed and the correct surface cutting speed for *each* diameter are automatically controlled. The flexible hydraulic feed system provides separate, independent feeds for each face of the turret. Fastermatics are available in four sizes; also in Platen Type machines.

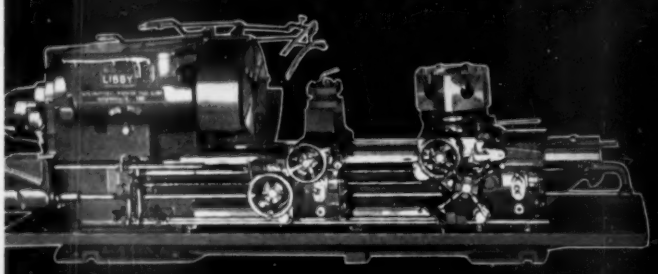
2–Surface Superfinishing!

Foster Superfinishers improve surface finish and remove surface irregularities on such parts as bearings and sliding members. Geometrically improved surfaces of 2 to 3 micro-inches, as measured with a profilometer, are produced with as little as .0002″ to .0003″ stock removal. Superfinishers are furnished in general purpose and special machines for miscellaneous or production superfinishing; also in attachments for use on engine or turret lathes.

3–Heavy Duty Turning and Boring!

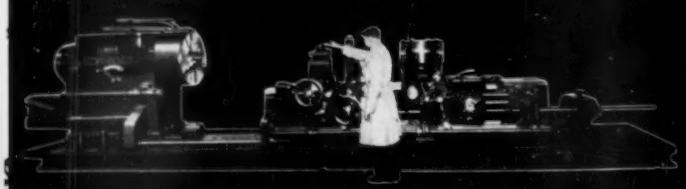
Libby Heavy Duty Turret Lathes are providing manufacturers with accurate, efficient, high production turning of large, heavy work. Close tolerances are assured, even while taking extra heavy cuts. Libby Heavy Duty Turret Lathes are available in a range of six sizes and capacities for every turning and boring requirement; also in Fixed and Adjustable Bed Gap Machines.

LIBBY HEAVY DUTY TURRET LATHES

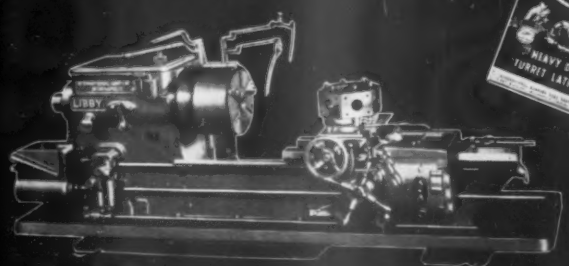


MODEL NOS. ➤➤	H	1-H	2-H	3-H	4-H	5-H
Swing Over Ways	18″	24″	27″	29″	32″	36″
Spindle Hole	5¼″ or 6¼″	5¼″ or 6¼″	8¼″ or 10¼″	10¼″ or 12¼″	8¼″, 10¼″ or 12½″	8¼″, 10¼″ or 12½″
Chuck Dia.	16″	18″	22¾″	24″	24″-28″	28″-32″
Turning Length	56″	56″	72″	72″	72″	72″

FREE: Write today for catalog covering the extensive line of Libby Type "H" Heavy Duty Turret Lathes.



LIBBY ADJUSTABLE BED GAP HEAVY DUTY TURRET LATHES can be furnished in the same sizes as the Type "H" Series listed above. Gap is adjustable from 26″ to 56″ to suit the particular work at hand.



LIBBY FIXED BED GAP HEAVY DUTY TURRET LATHES are available in the same sizes as the Type "H" Series listed above. Size of gap varies from 26″ to 56″ in 6″ increments.

INTERNATIONAL MACHINE

3 Vital Functions of INTERNATIONAL MACHINE TOOLS For War and Postwar Machine Production

AUTOMATIC turning and boring...surface superfinishing ...*heavy duty* turning and boring...

Today, these three vital functions are being performed with consistent efficiency and precision by International Machine Tools in numerous plants throughout the Nation. While every one of these functions is essential to industry *in our war effort,* the same efficiency and precision must also be maintained *in the peace to follow!*

Now and in the future, you can depend on International Machine Tools for the speed and precision your machining operations demand.

Write the FOSTER DIVISION for FREE catalogs and data on Fastermatic Universal Automatic Turret Lathes and Chucking Tools, Superfinishing Machines and Attachments, and Barker Wrenchless Chucks and Vise

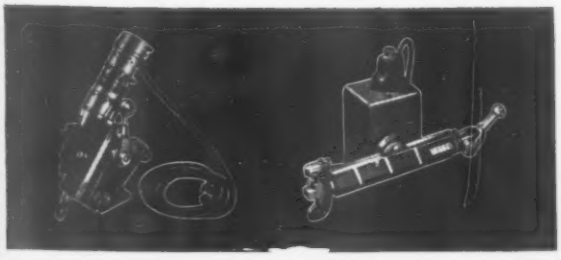
Write the LIBBY DIVISION for FREE catalogs and data on Libby Heavy Duty Turret Lathes and Chucking Tools, and Fixed and Adjustable Bed Gap Heavy Duty Turret Lathes.

Foster and Libby Engineers will be glad to make suggestions, specific recommendations and estimates. There is no obligation. Write today.

INTERNATIONAL MACHINE TOOL CORPORATION

FOSTER DIVISION
1104 Beardsley Ave.
Elkhart, Indiana

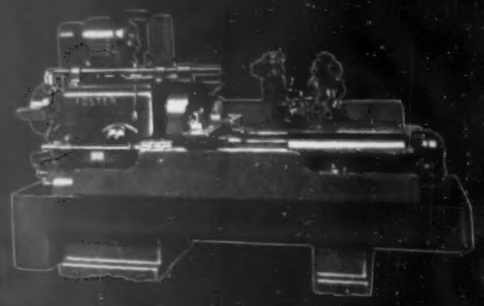
LIBBY DIVISION
1130 West 21st St.
Indianapolis, Indiana



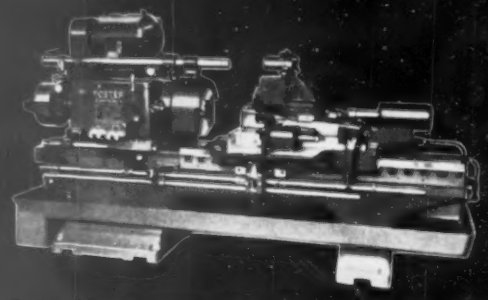
FOSTER SUPERFINISHING ATTACHMENTS

Furnished in four different sizes for mounting on cross slide of engine lathes or turret lathes. The only additional equipment necessary when performing superfinishing operations with these attachments is a lubricant supply for the stone. This equipment, consisting of pump, reservoir and necessary piping, can also be furnished.

AUTOMATIC TURRET LATHES



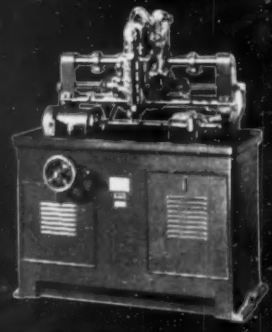
MODEL NOS. >>	1-FU	2-FU	3-FU	4
Swing Over Bed	21"	25¼"	28¼"	35
Turret Feed Length	11" max.	12 9/16" max.	12½" max.	18 1/1
Cross Slide Travel	3¼"	3¾"	5"	6
Spindle to Turret Face	41 11/16"	50 3/16"	53"	67
Spindle to Turret Face at Start of Feed	36 11/16" max.	44¾" max.	47½" max.	61¼



FOSTER PLATEN TYPE FASTERMATIC UNIVERSAL AUTOMATIC LATHES—Platen Type Chucking Machines are available in the same sizes as the Fastermatic Indexing Turret Type listed above. Platen types have specially designed tool carrying units, including front and rear cross slide and a main slide—all mounted on a platen.

FREE: Write today for catalog covering the complete line of Foster Fastermatic Universal Automatic Turret Lathes.

FOSTER SUPERFINISHING MACHINES



FOSTER GENERAL-PURPOSE SUPERFINISHERS—18" and 4" x 36"—For superfinishing a wide ran miscellaneous cylindrical parts, or for high produ This machine permits the development of extremel surfaces from work produced by ordinary cutting to grinding equipment. It produces a superfinish on a t surface by the use of both coarse and fine abrasive st

FOSTER FLAT SURFACE SUPERFINISHERS—Superfinishes flat surfaces up to 10" in diameter. Work is held on a suitable fixture or magnetic chuck. Available as a special machine for large work. For small work a flat surface superfinishing attachment can be furnished for the General-Purpose Superfinisher (above). Pump, reservoir and piping included.

FREE: Write tod catalog covering Superfinishing Ma and Attachments

TOOL CORPORATION

Libby HEAVY DUTY TURRET LATHES

FACTS *you should know about* HARD-FACING MATERIALS

By means of hard-facing—which is the process of welding on to wearing parts a coating, edge, or point of a hard metal—it is possible to protect metal surfaces that normally wear away rapidly in service. This method not only makes industrial parts last from two to twenty-five times longer, but also reduces time lost for replacements, lowers power consumption, and helps to maintain high efficiency. In addition, hard-facing often makes possible the use of substitute base metals in the fabrication of parts. Outlined below are facts you should know when selecting hard-facing rods.

Properties Required for Hard-Facing

High-quality materials are required to obtain full benefit from hard-facing. The materials should possess the following properties:

1. Inherent hardness.
2. Resistance to abrasion.
3. "Red Hardness"—or the retention of initial hardness up to red heat.
4. Ease of application by ordinary welding techniques.
5. Resistance to high-temperature oxidation during application by welding.
6. A melting point slightly lower than that of steel, the usual base metal.
7. A coefficient of expansion close to that of the base metal.

Types of Materials Available

Group 1—These alloys are relatively low in cost. They are alloy steels consisting of an iron base with less than approximately 20 per cent of alloying constituents. *Example: Hascrome iron-base hard-facing rod.*

Group 2—These are iron-base alloys containing more than 20 per cent of alloying elements. They are useful for services involving more severe abrasive wear than the metals of group 1. *Example: Haynes Stellite "93" hard-facing rod.*

Group 3—This group is made up essentially of non-ferrous cobalt-chromium-tungsten alloys. Hardness is inherent and retained at high temperatures. *Example: Haynes Stellite grades 1, 6, and 12 non-ferrous hard-facing rod.*

Group 4—The fourth group consists of tungsten carbide "diamond substitute" materials, supplied in a variety of forms, and combining a maximum of wear resistance with cutting qualities when applied on the cutting edges of earth drilling tools. *Example: Haystellite composite rod, tube rod, and inserts.*

Send for Helpful Literature

Write for the booklet *"Hard-Facing Materials Data."* It can be tacked on the shop wall for convenient reference on such points as the selection of the right rod, application techniques, and amount of rod required. A copy will be sent without charge.

HAYNES STELLITE TRADE MARK

HAYNES STELLITE COMPANY

Unit of Union Carbide and Carbon Corporation

New York, N. Y. UCC Kokomo, Ind.

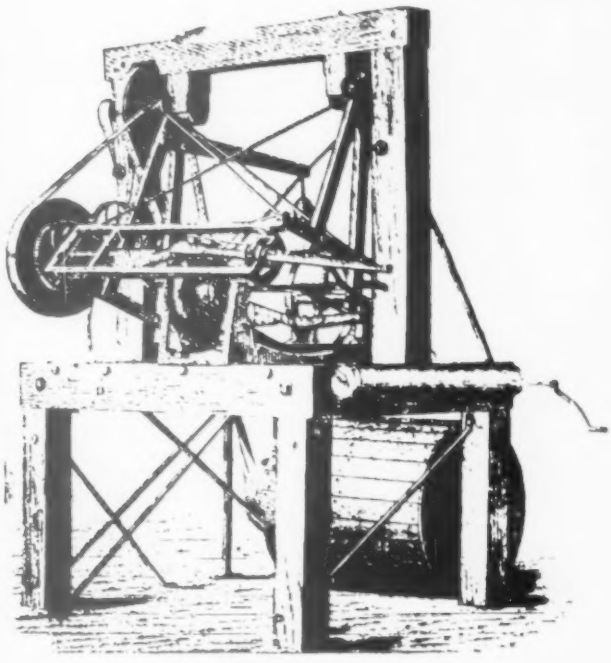
Chicago—Cleveland—Detroit—Houston—Los Angeles—San Francisco—Tulsa

HARD-FACING RODS FOR EVERY PURPOSE

The words "Haynes Stellite," "Hascrome," and "Haystellite," are registered trade-marks of Haynes Stellite Company.

A Curious Machine

has lately been advertised — that will churn, scrape Potatoes, rock the cradle — and Darn Stockings —



THIS bit of early-American humor, which appeared in a New England newspaper more than a century ago, may well have been inspired by the "curious machine" shown here. It marks the beginning of a public awareness of the mechanical wonders ahead . . . Back in the days when "Industry" was spelled with a I it was the birth notice of the Machine Age in America.

Picture the times when that notice appeared: Witchcraft was still a subject for serious dispute, and sane men believed that insanity was caused by Devils. Cocked hats and big-buckled shoes were still to be seen, and sober men declared the steam engine a passing idea, over their tankards of flip in the taverns. . . . The hammer and anvil were the symbol of the times, and every part of every musket or cannon or clock was made individually, by hand.

That was the setting. And in the midst of it, some of the greatest inventive geniuses the world has ever known were quietly changing the shape of things and of thought with the "curious machines" they were inventing. Such curious machines as the one shown here. Machine *tools*, with which each part could be made in quantity, and precisely alike. . . . Tools that were to make machines that would churn, scrape potatoes, rock the cradles of industry, and even darn stockings!

* * * *

BUT they were doing more of importance than inventing curious machines. Those men of mechanical genius were founding a handful of machine tool companies that have literally made possible all the rest of industry.

One of those companies — Jones & Lamson — is here today, a direct descendant of the first great machine tool builders in America. With a heritage of skills, knowledge and equipment that has constantly grown, from the very birth of our industrial age, Jones & Lamson engineers and service men are particularly qualified to serve any phase of industry today and during the difficult period of post-war readjustment ahead.

Jones & Lamson service is at *your* service now!

JONES & LAMSON
MACHINE COMPANY
SPRINGFIELD, VERMONT, U. S. A.

Manufacturers of Ram & Saddle Type Universal Turret Lathes . . . Fay Automatic Lathes . . . Automatic Thread Grinding Machines . . . Comparators . . . Automatic Opening Threading Dies and Chasers.

Profit Producing Machine Tools

Speed

Accuracy

Low In Cost

HONE TO VICTORY

Super-Smooth Finish

Inexpensive to Operate

With THE SUNNEN PRECISION HONING MACHINE

SPEED to meet today's ever-increasing demand for vital implements of mechanized war.

ACCURACY to insure fewer rejects and absolute interchangeability of parts. Super-smooth finish.

LOW COST — Both initial and operating.

WIDE RANGE — Handles any internal diameter from .185" to 2.400".

EASY TO OPERATE — Workers in "teens" — even girls — can be trained to do expert work in a few hours.

CONSERVES — Relieves big internal grinders for other jobs. No fixtures needed — work held in hand.

These are only a few of the reasons why it will pay you to put Sunnen honing to work in *your* plant — as it has hundreds of leading manufacturers.

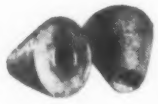
Aluminum Aircraft Link "produces high finish without bell-mouthing."

Inner Bearing Ring "Accurately removes last 'tenth' of stock."

"Strict alignment maintained between two holes."

Drawing and Blanking Die "Saves time in producing smooth base metal finish."

Bronze Valve. The Sunnen method of honing is used to secure a high finish and accuracy.



Cones for Wheel Balancing Machine "Accurately align hones two interrupted surfaces."

Saved time in producing a smooth, accurate finish on this bronze remote control valve body.

Aviation Hydraulic Cylinder made of Aluminum-Alloy. Improves the quality of the bearing surface. An extremely smooth surface-finish is secured.

Diesel Engine Fuel Injector Cylinder "So accurate that a piston can be fit within .00005 inch."

Aircraft Valve Tappet Roller. 4-Micro finish.

Hardened Steel Inner Bearing Race honed to .00005" limit. Surface finish improved; errors of out-of-roundness eliminated.

Drill Jig Bushing "Increases sales appeal of product."

SUNNEN

Write for FREE BULLETIN

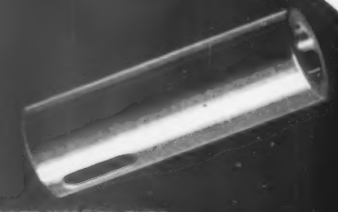
giving complete information or, if you prefer, a Sales Engineer will be glad to call with his demonstrator and show you what this machine can do on your job.

SUNNEN PRODUCTS CO., 7932 Manchester Ave., St. Louis, Mo.

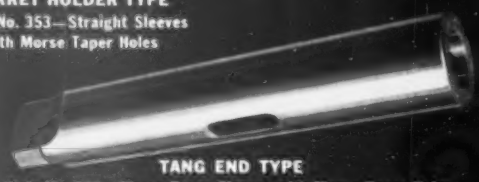
Canadian Factory: Chatham, Ontario

10 to 20 TIMES LONGER LIFE

After 2 months Equal Service in identical machines—Which of these 2 SLEEVES would YOU depend on for ACCURACY?



TURRET HOLDER TYPE
Style No. 353—Straight Sleeves with Morse Taper Holes



TANG END TYPE
Style No. 350—Morse Taper Sleeves with Morse Taper Holes
Style No. 351—B. & S. Taper Sleeves with B. & S. Holes
Style No. 356—Morse Taper Sleeves with B. & S. Taper Holes
Style No. 358—B. & S. Taper Sleeves with Morse Taper Holes

TAPPED END FOR DRAW BAR
Style No. 352—B. & S. Taper Sleeves with B. & S. Taper Holes
Style No. 359—B. & S. Taper Sleeves with Morse Taper Holes

EXTENSION TYPE
Style No. 354—Morse Taper Extension Sleeves with Morse Taper Holes

THE SLEEVE illustrated on the left is an ordinary soft steel sleeve; the one on the right is a Midwest Hardened and Ground Sleeve. Because Midwest Sleeves are scientifically hardened and precision ground, their length of accurate life is from ten to twenty times longer than ordinary sleeves. The hardened surfaces do not easily mar or chip through handling and use, permanent taper concentricity is maintained. Where these Midwest Sleeves are used in drill presses or milling machines, the tools placed in them are held in accurate alignment. Drill breakages are reduced, spoiled production is avoided.

Furthermore, the conservation of steel and getting the utmost out of cutting tools are highly important matters at the present time. The longer life of Midwest Sleeves saves vital steels—the steels that would otherwise be consumed through repeated identical replacements of soft steel sleeves which quickly become worn, marred and discarded.

PROMPT DELIVERY IN MANY SIZES CAN BE MADE FROM STOCK

MIDWEST

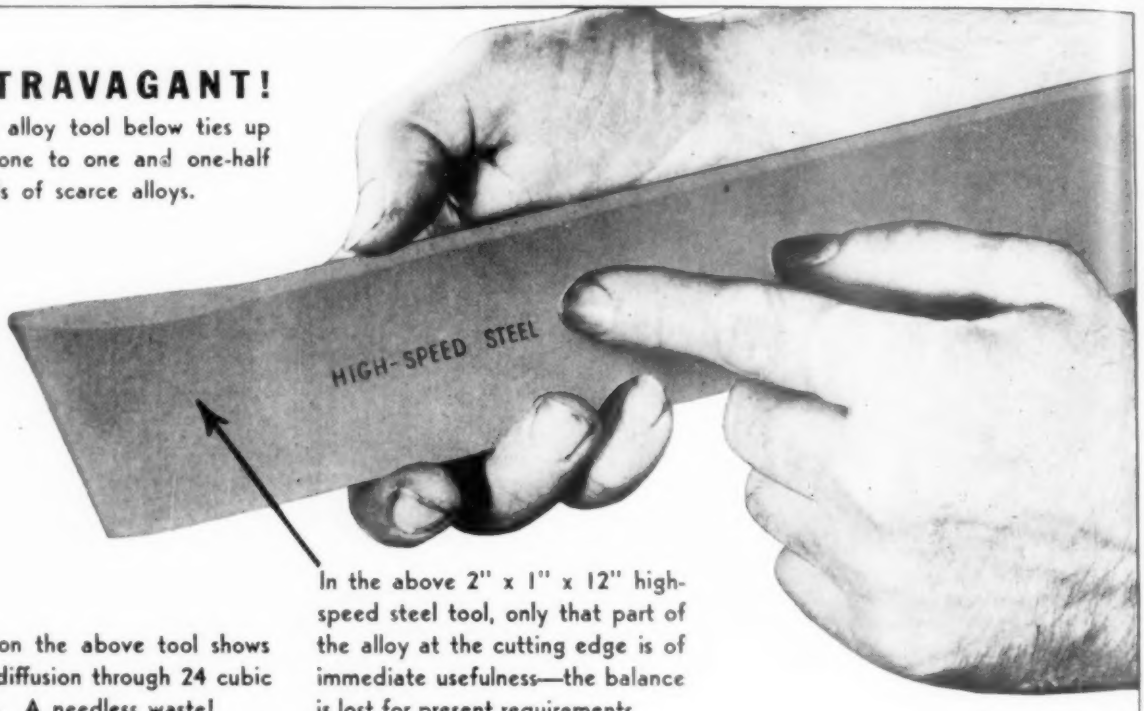
MILLING CUTTERS • SLEEVES
COUNTER BORES • END MILLS
REAMERS • SPECIAL TOOLS • FORM TOOLS
CARBIDE TIPPED TOOLS • ADJUSTABLE HOLDERS

MIDWEST TOOL & MFG. CO., 2364 W. JEFFERSON AVE., DETROIT, MICH.

FIRTHITE POINTS THE WAY TO SAVE ALLOYS

EXTRAVAGANT!

Solid, alloy tool below ties up from one to one and one-half pounds of scarce alloys.

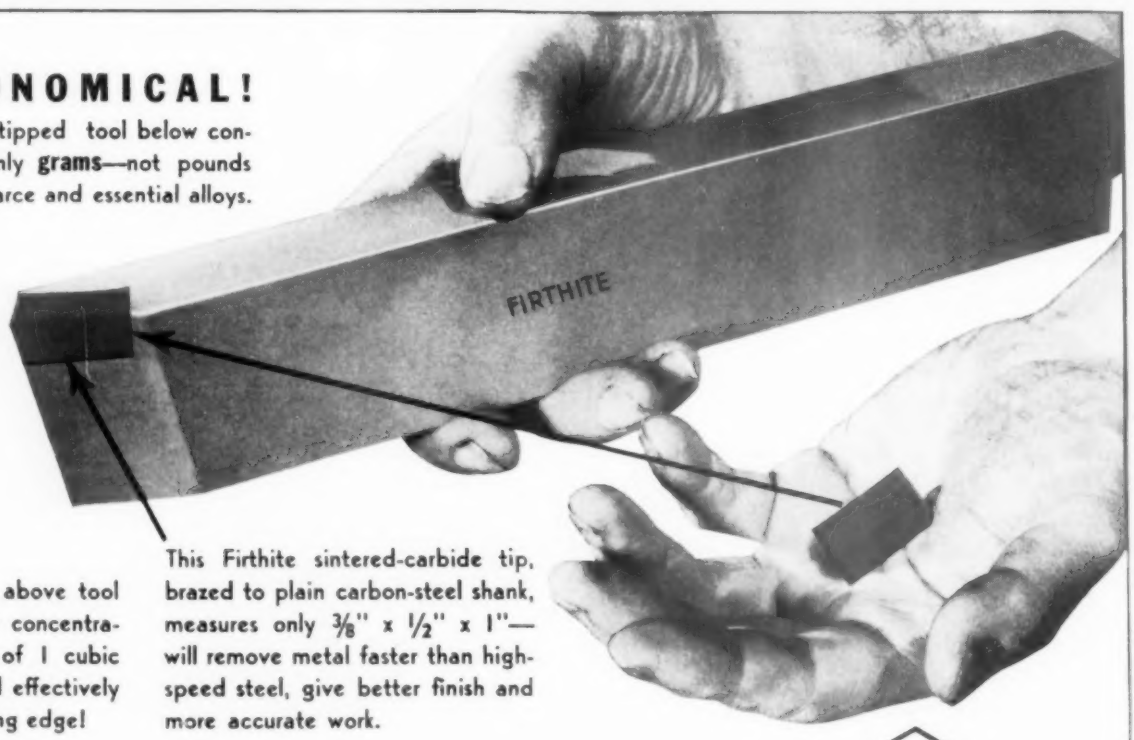


PINK on the above tool shows alloy diffusion through 24 cubic inches. A needless waste!

In the above 2" x 1" x 12" high-speed steel tool, only that part of the alloy at the cutting edge is of immediate usefulness—the balance is lost for present requirements.

ECONOMICAL!

Firthite-tipped tool below contains only **grams**—not pounds—of scarce and essential alloys.



RED on the above tool shows alloy concentration, 3/16 of 1 cubic inch, placed effectively at the cutting edge!

This Firthite sintered-carbide tip, brazed to plain carbon-steel shank, measures only 3/8" x 1/2" x 1"—will remove metal faster than high-speed steel, give better finish and more accurate work.

FIRTHITE

Firth-Sterling
STEEL COMPANY

Offices: McKEESPORT, PA. NEW YORK - HARTFORD - PHILADELPHIA - CLEVELAND DAYTON - DETROIT - CHICAGO - LOS ANGELES

FIRTHITE

LEADS THE WAY

TO INCREASED PRODUCTION

Metal Removed with Tungsten Carbide

Metal Removed with Tungsten-Tantalum Carbide

Metal Removed with Tungsten-Tantalum-Titanium Carbide

Metal Removed with Tungsten-Titanium Carbide

1929 **Tungsten Carbide** Tips, brazed to plain carbon-steel shanks, gave greatly increased production in machining cast iron, bronze, and brass—not steel. So Firthite then developed:

1932 **Tungsten-Tantalum Carbide** for faster steel cutting. Certain difficulties of manufacture and use led Firthite next to develop:

1934 **Tungsten-Tantalum-Titanium Carbide** (patent No. 1,973,428 of September 11, 1934). Representing a marked improvement, this type soon became the standard carbide for steel cutting. Seeking further improvement, Firthite next introduced:

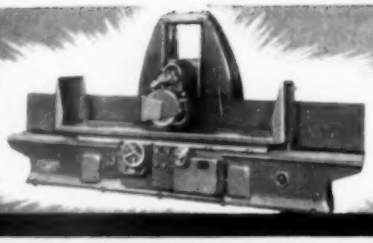
1940 **Tungsten-Titanium Carbide.** Tantalum now became unnecessary and merely an added expense to the user. The new development gave better, faster, cheaper steel cutting . . . released thousands of pounds of scarce Tantalum for indispensable uses in the electrical and chemical fields.

TODAY **FIRTHITE TUNGSTEN-TITANIUM CARBIDE LEADS THE WAY!**

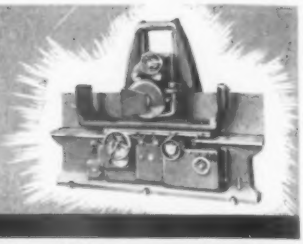
Firth-Sterling
STEEL COMPANY

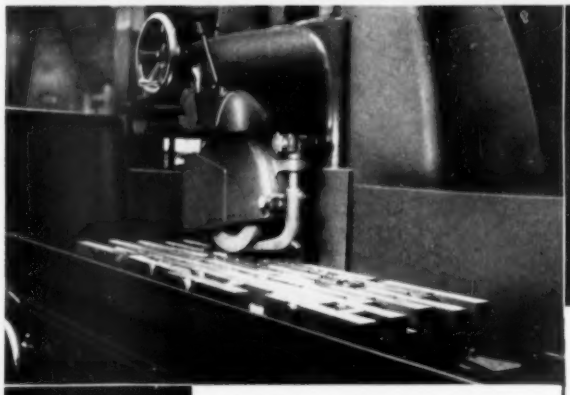
TOOL STEELS AND CARBIDES FOR COMPLETE SHOP TOOLING

Offices: McKEESPORT, PA. NEW YORK - HARTFORD - PHILADELPHIA - CLEVELAND
DAYTON - DETROIT - CHICAGO - LOS ANGELES

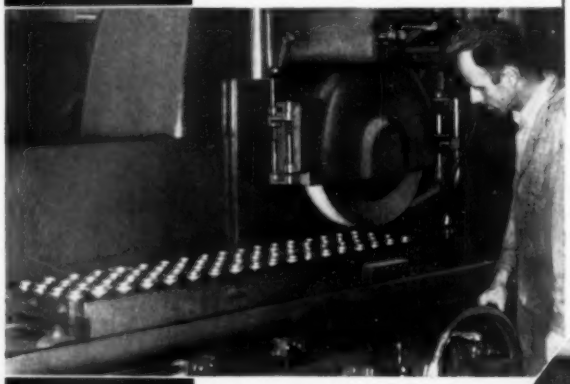


MATTISON
HIGH-POWERED PRECISION SURFACE GRINDER

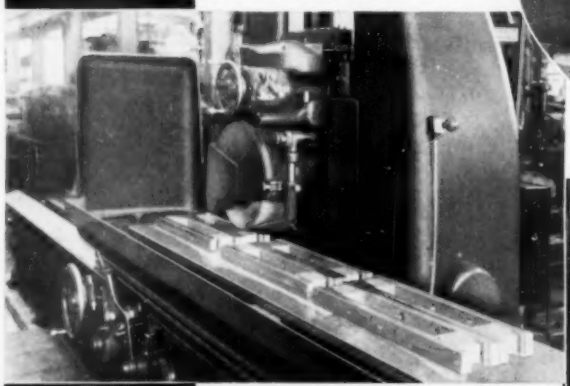




● Cross Slide Draw Bars formerly ground 5 pieces at a time. Now ground on a Mattison Grinder 27 pieces per load. 50% time saving.



● Caps previously ground few at a time on small grinder. Now, Mattison Grinder handles 75 at a time. Time was reduced from 7 hours to 30 minutes.

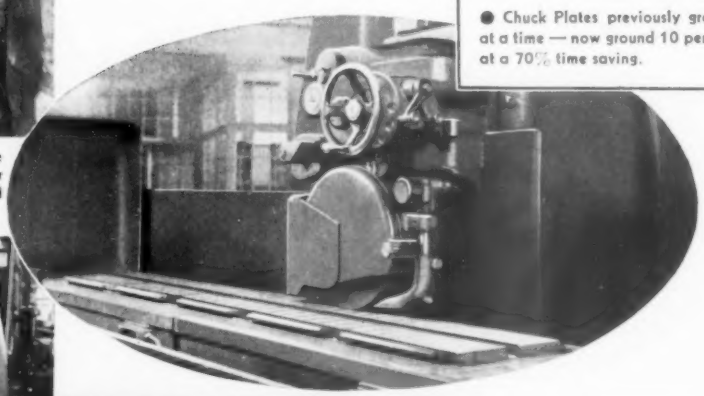


● Head Slide Guides formerly ground one at a time in 36 minutes — Now ground on a Mattison Grinder 9 pieces per set-up at a 77% time saving.

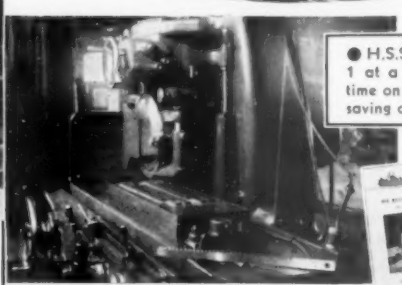
Large Table Space Means More Pieces per Load and GREATER PRODUCTION

Examples: Grinding 75 pieces per load instead of 18 — cut time 80% . . . . . 10 pieces per load instead of 2 — cut time 70%, etc.

Jobs shown indicate the possibilities for increased production by handling large quantities per set-up. In your efforts to obtain maximum production, it will pay you to check into the capabilities of the Mattison Grinder.



● Chuck Plates previously ground 1 at a time — now ground 10 per set-up at a 70% time saving.



● H.S.S. Broaches previously ground 1 at a time — now ground 10 at a time on a Mattison Grinder, at a time saving of 50%.

SET-UP SHEETS

Containing complete information regarding these and similar jobs will be sent upon request.

MATTISON MACHINE WORKS
ROCKFORD • ILLINOIS

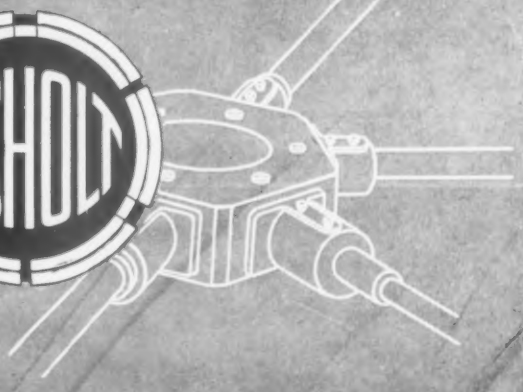
Make it fit to fight!

The American idea of mass production has created a world of interchangeable parts, one dependent upon the other. Wherever it is made—in your plant or in that of a subcontractor, the essence is accuracy. Machine tools like Gisholt Turret Lathes make this possible—assure the precision that makes parts fit to fight. Their proper use is vital to America—and to you.

GISHOLT MACHINE COMPANY · MADISON, WISCONSIN

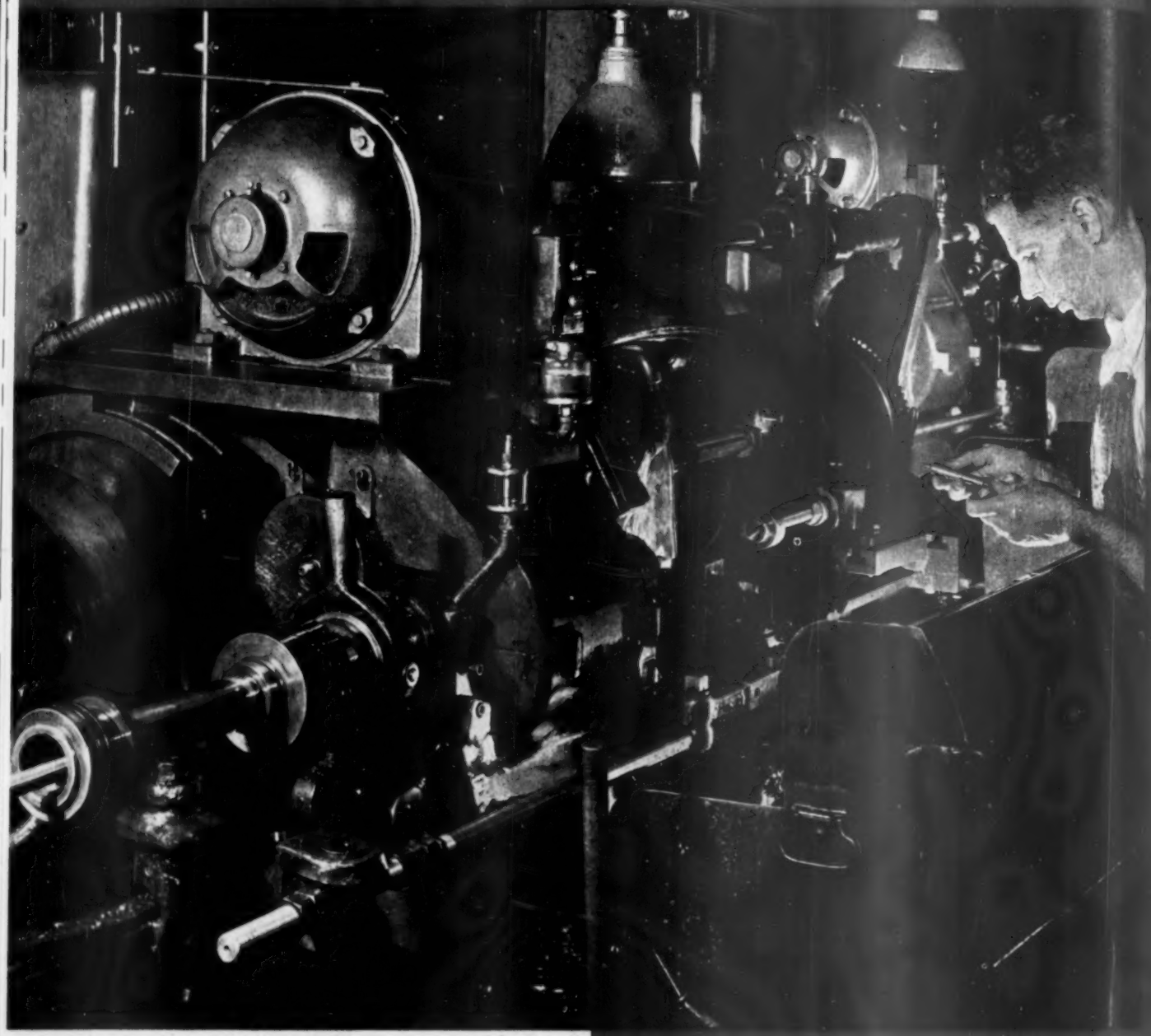
Look Ahead — Keep Ahead — With Gisholt Improvements in Metal Turning

GISHOLT



TURRET LATHES ★ AUTOMATIC LATHES ★ BALANCING MACHINES

CLEVELAND *Single Spindle* AUTOMATICS SAVE 50% IN COST, RELEASE TWO OTHER MACHINES IN WHITMAN & BARNES SMALL TOOL PRODUCTION



● Whitman & Barnes avoid "bottle-necks" in small tool production by adopting faster methods of manufacture as soon as they are recognized and proved practical. Production of center reamers and jobber drills was recently speeded up by installation of Model B, Cleveland *Single Spindle* Automatics. Model B is built in sizes from 1 1/16-inch to 2 1/2-inch capacities, and used on such jobs as making shafts of multiple diameters, various types of studs, nipples, tap blanks and pins. Built in short and long lengths up to 18-inch stock feed, cutting tools can be mounted singly or in series for turning one or more diameters of various lengths simultaneously. Ask for descriptive bulletin.

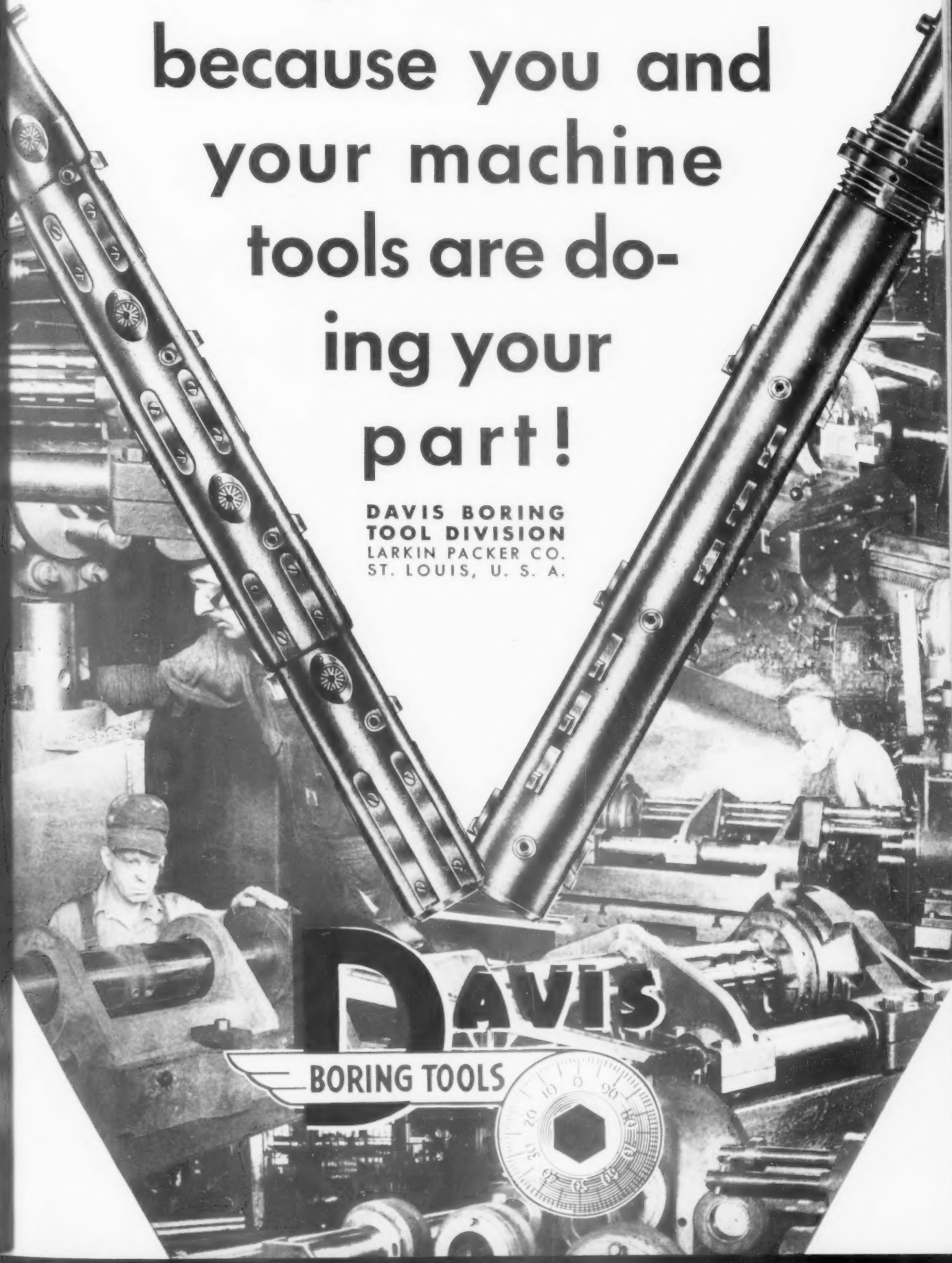
THE CLEVELAND AUTOMATIC MACHINE COMPANY
2269 ASHLAND ROAD, CLEVELAND, OHIO
Sales Offices: *Chicago:* 20 N. Wacker Drive, Civic Opera Bldg., Room 1408

CLEVELAN
Single Spindl
AUTOMATIC

MODEL A—Built in 1 1/16-inch to 9 1/2-inch capacities inc

Plenty–ON TIME,

because you and your machine tools are doing your part!



DAVIS BORING TOOL DIVISION
LARKIN PACKER CO.
ST. LOUIS, U. S. A.

MACHINE OF THE MONTH

REPARED BY THE SENECA FALLS MACHINE CO. "THE Lo-swing PEOPLE" SENECA FALLS, NEW YORK

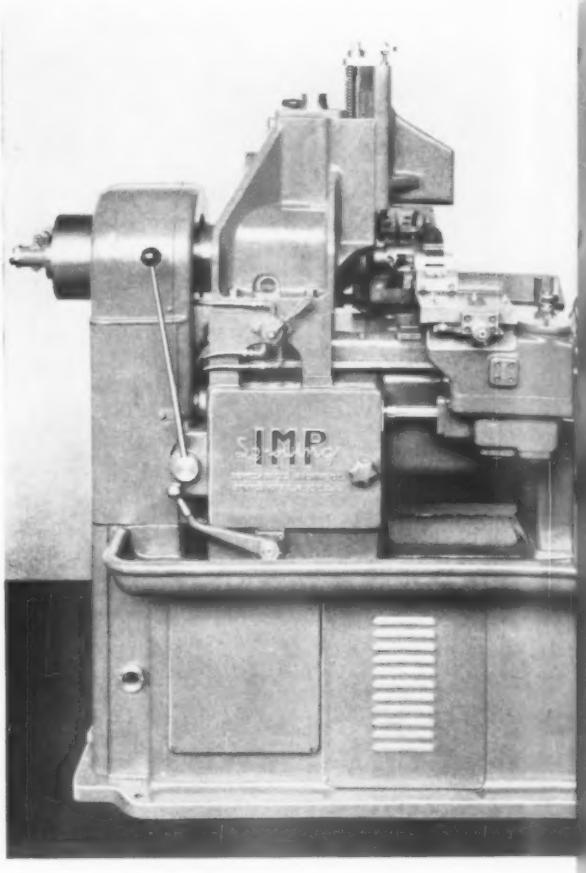
Lo-swing IMP LATHE

meets exacting demands on SHOCK ABSORBER PART JOB

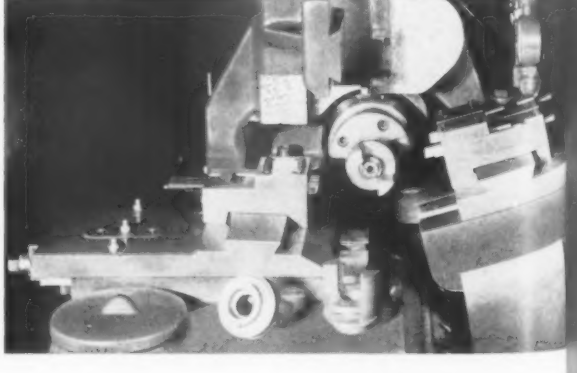
Problem: To finish turn various diameters and shoulders, and face both ends of a shock absorber part . . . to maintain a close degree of accuracy in volume production . . . to provide machines easily changed-over for other work.

Solution: Two *Lo-swing* IMP Lathes were selected for this job primarily because they provided the necessary speed, productive capacity and close accuracy demanded. By equipping these IMPS with standard Overhead Third Arms it was possible to avoid using complicated form tools (objectionable when cemented carbide used as in this case), and greatly simplify the tooling setup. The demand for flexibility was admirably met with the IMP'S inbuilt, fully-mechanical Quick Change-over Mechanism. This feature was particularly important to the purchaser . . . a manufacturer doing extensive contract work, who did not want to charge the machine investment entirely against this particular job.

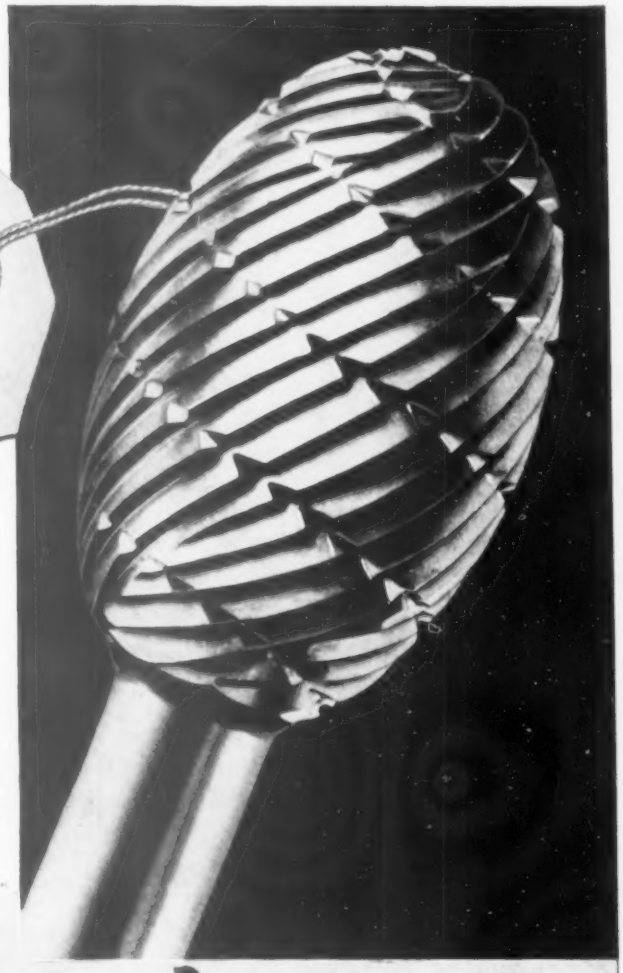
Cemented Carbide Tools are used at a cutting speed of 300 ft. per min., and feed of .005" per rev. Production obtained is 65½ pieces per hour at 85% efficiency.



As shown in the illustrations, the Fr
Carriage carries three tools which turn th
diameters on the OD; a single tool on
Third Arm finishes a step on the par
very accurate limits; the Back Attachm
equipped with two tools, faces both e
of the piece. The work is held by an
operated Draw Bar.



Jarvis POWER TOOLS



SALVAGE and SAVE MEN, MONEY and MATERIALS

Send your ground rotary files back to us for regrinding. The saving is considerable — the service is fast. Regrind your rotary files and avoid shortages of these valuable, time-saving tools.

THE CHARLES L. JARVIS CO., MIDDLETOWN, CONN.

TAPPING ATTACHMENTS • FLEXIBLE SHAFT MACHINES • GROUND ROTARY FILES

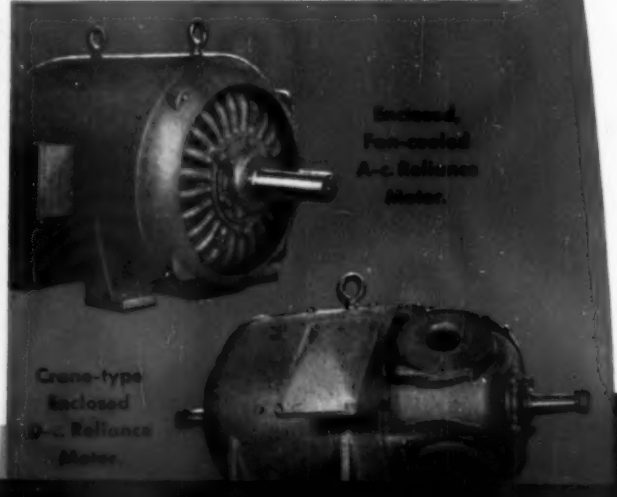
These 2 Words MAKE MOTOR-DRIVE More Than POWER!

Motor-drive provides within itself a means of:

Speed Control	**Reversing**
Braking	**Remote Control**
Tandem Operation	**Controlled Acceleration**
Tension Control	**Safety**

Slow Speeds for inching, threading, inspection

pplying them to boost production and improve quality
APPLICATION ENGINEERING. That's our business.



● PRODUCTION jobs, not merely power jobs, are awaiting these RELIANCE MOTORS. They will do *many things* which will aid in performing some part of a production process faster, better, or more safely. Users of these motors will have more for their money because they started their production plan with the question, *"What can we make the motor do besides supply power?"* Get the complete answer to this question while your plans are in their early stages. Invite a Reliance man to sit in . . . He may not have all the answers, but he will have enough of them to be a big help in finding the right ones.

RELIANCE ELECTRIC & ENGINEERING COMPANY
1088 Ivanhoe Road • Cleveland, Ohio

BIRMINGHAM • BOSTON • BUFFALO • CHICAGO • CINCINNATI • DETROIT • GREENVILLE
HOUSTON, TEX. • LOS ANGELES • MINNEAPOLIS • NEW YORK • PHILADELPHIA • PITTSBURGH
PORTLAND, ORE. • ST. LOUIS • SAN FRANCISCO • SYRACUSE, N.Y. • and other Principal Cities

RELIANCE A-C MOTORS

IN 1943 More Precision Faster

with HEALD PRECISION BORING AND GRINDING MACHINES

Building the huge quantities of planes, tanks, guns and ships needed today calls for speed and precision in manufacturing — speed to get vital material quickly to fighting fronts, and precision to insure dependable fighting service.

Both results can be obtained by use of precision boring and precision grinding — hence the universal application of Heald Bore-Matics and Heald Internal and Surface Grinding Machines for all types of finishing operations on vital components of planes, of tanks, of guns, of ships. In fact, in aircraft alone, more than 100 different important parts are precision finished on Heald Machines.

In 1943 Heald Bore-Matics and Internal and Surface Grinding Machines will be in action on every precision front — producing *more precision faster* for industry, for America. Building these vitally needed machines is our job for 1943 — our contribution to Victory.

In 1943 Heald's entire output of precision boring and precision grinding machines will go to the production lines of the nation for precision finishing — an infinite variety of parts used in the matériel of War. Heald Precisionized Parts are found in

aircraft engines . . aircraft propellers . . aircraft landing gear . . aircraft instruments . . aircraft fuselages . . aircraft gun turrets . . ships . . submarines . . tank engines . . tank guns . . motorized military vehicles . . motorcycles . . diesel engines . . gyro instruments . . gun directors . . guns . . machine guns . . anti-aircraft guns . . gun mounts . . rifles . . cartridges . . shells . . torpedoes . . radio . . telephone systems . . searchlight mounts.

HEALD *More Precision Faster*

MANUFACTURERS OF PRECISION BORING AND PRECISION GRINDING MACHINES
THE HEALD MACHINE CO. Worcester, Mass., U. S. A.

★

Change in Firm Name

★

Sav-way Tool and Machining Co.

BECOMES

Sav-way INDUSTRIES

In the past this company has been known as Sav-way Tool and Machining Co., engaged in the manufacture of precision tank and aircraft parts . . . a line of gauges . . . and internal grinders.

Today Sav-way is composed of six major divisions:

End Mill
Gauge
Internal Grinder
Plastic
Precision Production
Specialty Engineering

With this change of name and expansion in activities, we announce the opening of our new general offices and main plant at 4875 East Eight Mile.

In addition, two other plants have recently been purchased and a fourth is now in the course of construction. These four plants, together with our physical and chemical laboratory, have been newly equipped with the latest and most efficient machinery to help meet present and postwar needs.

"It will be done" is the significant slogan adopted by the young and aggressive personnel of:

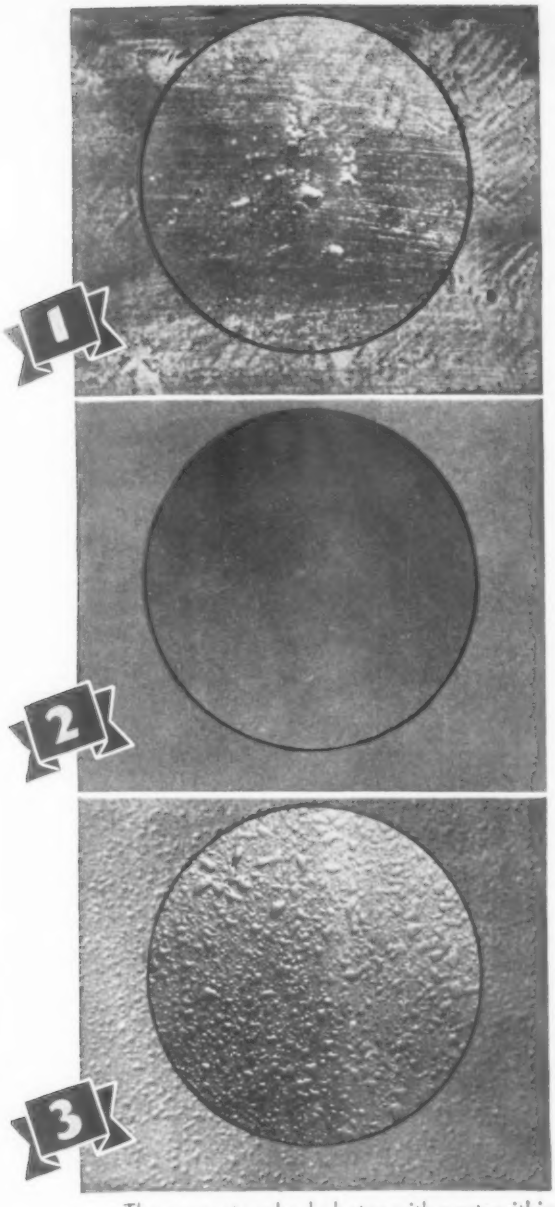
Sav-way INDUSTRIES

4875 EAST EIGHT MILE

DETROIT, MICHIGAN

Representatives throughout U. S. A. and Canada

★



These unretouched photos with parts within circle actual size show 1. Bare Casting. 2. Same surface after one pressure pot spray coat has been applied. 3. After application of medium stipple second coat over first coat. Left half shows surface after a coat of Machine Tool Enamel has been applied over the two stipple coats.

"There's Class to this EGYPTIAN Machine Tool Finishing System."

SPEED with GOOD APPEARANCE

No need to sacrifice that "classy" look to your machine tools and other metal products. Adopt the new EGYPTIAN Machine Tool Finishing System and you: 1. Comply with WPB Limitation Order L-108; 2. Give Full Protection to your Product without Sacrificing its Appearance; 3. Save Time, Labor and Materials.

Already thoroughly tested in service this three coat system has abundantly demonstrated its efficiency. Produces a stipple effect, minimizing those rough spots found in every casting by blending them with the rough finish. Can be used also for a smooth finish when desired since it gives a maximum of filling and smoothness to castings consistent with a complete spray job.

Two coats of the stipple are sufficient, with a coat of EGYPTIAN Machine Tool Enamel to complete the job. (See illustrations from actual photos.) Any make of spray equipment may be used, suitable accessories being furnished by the manufacturer.

Fast, air drying, with no primer required, this new system is oil and alkali resistant, may be applied by brush instead of spray gun when desired, and finishes level, rounding out as it dries.

Send for trial order at drum prices. Have you a copy of our new Gov't "Spec" Book? Gladly sent free on request on business letter-head. Ask for "Spec" Book

THE EGYPTIAN LACQUER MANUFACTURING CO.
ROCKEFELLER CENTER—NEW YORK, N. Y.

EGYPTIAN Superior FINISHES

VALLEY FORGE was a Forg

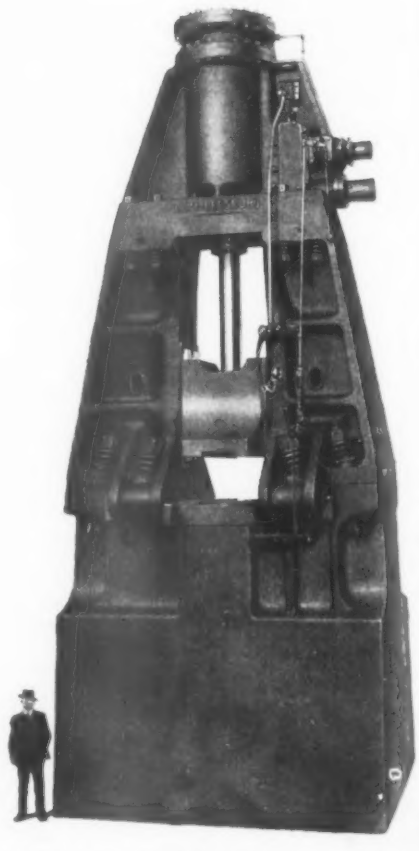
IT is significant that one of the most inspiring names in American history is the me of a forge—Valley Forge. r the scene of the "Gethsem- e of the American Revolu- n" took its name from an iron nace, operating an early type forging hammer, situated in e beautiful Pennsylvania hills at shelter the winding Valley eek to its juncture with the huylkill River.

that dread winter of 1777, e spirit of our forefathers, like e iron on the anvil of the forge the valley, was beaten and rged by the hammer blows of versity, privation and want, to the tough unyielding metal independence.

That is the virtue of forging—of *drop* forging in particular. It gives maximum tensile and torsional strength because of controlled grain flow and distribution of metal. Safety through concentration of grain structure at points of greatest shock and strain, and high resistance to fatigue are qualities that only forging can give.

The drop forgings that are being produced in ever increasing quantities on Chambersburg Hammers for the vital war needs of the United Nations are a symbol of the spirit of America today, hammered and toughened into unbreakable resistance on the Valley Forges of adversity and in the fires of self-imposed discipline.

AMBERSBURG ENGINEERING CO., CHAMBERSBURG, PENNA.



The giant mechanism shown above is a Chambersburg steam drop forging hammer—modern successor to the hammer in the Valley Forge of 1777. Like its predecessor, this Chambersburg hammer is forging munitions of war . . . vital parts that make up the modern tank, airplane, machine gun, and all the other equipment that depend on drop forgings to "withstand the unpredictable" stresses and strains of modern warfare.

CHAMBERSBURG

AMMERS · CECOSTAMPS · PRESSES

THE 8 INCH SPINDLE CAPACITY Acme-Gridley

LARGEST MULTIPLE SPINDLE AUTOMA

INCREASES OUTPU TEN TIMES . .

A WAR ASSIGNMENT — AGAINST TIME

With total war came the jump — demand from hundreds to thousands of airplane motors and tanks per month. These require precision parts of large diameter and on schedules that single spindle methods could not possibly meet.

Our Government said "Build 8 inch Acme-Gridley 4 Spindle Automatics for these parts manufacturers; apply your experience, skill, plant facilities — and lose no time."

In less than 5 months we designed, built, tooled and delivered the first machine to customer's plant. Immediately and without makeshift it was pronounced "running to perfection" and PRODUCING THE JOB 10 TIMES FASTER THAN HAD BEEN POSSIBLE BY THE FASTEST SINGLE SPINDLE METHOD PREVIOUSLY USED.

The record time from design to delivery included our building jigs, fixtures for complete interchangeability of tooling and parts. And continued deliveries of many more of these 35 ton giant multiples have not interrupted our production of the hundreds of six spindle Acme-Gridley munition automatics in other sizes on war schedules.

We are proud to have again fulfilled this, our special war assignment, on time and *in* time.

THE NATIONAL ACME

170 EAST 131ST STREET • CLEVELAND, OHIO

ACME-GRIDLEY 4-6 AND 8 SPINDLE BAR AND CHUCKING AUTOMATICS • SINGLE SPINDLE AUTOMATICS • AUTOMATIC THREADING DIES AN

SOME SAY **CYLINDER** - SOME SAY **MOTOR**

WHICH IS CORRECT?

FOR *Senacon* POWER UNITS, MOTOR IS CORRECT!

WHY? Because integral incorporation of an exclusive "normal positioning" valve has transformed the ordinary air cylinder into a compact, highly versatile, self-contained power unit, a MOTOR!

Fitted with a Senacon Motor you have *controlled* air power for use either manually, or in synchronization with the machine tool, for supplying power to:

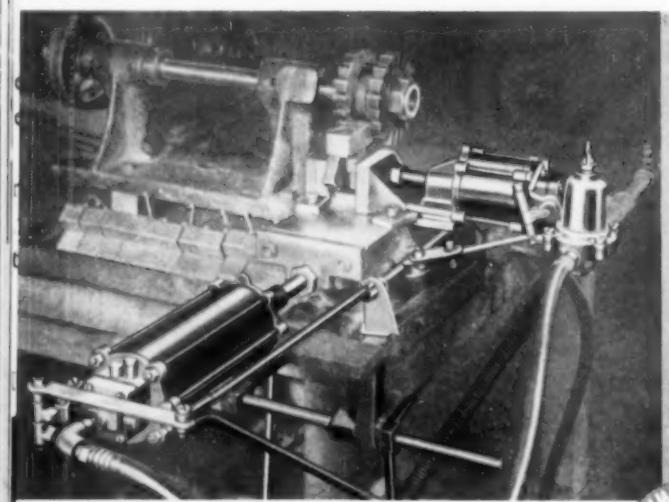
1. Open and close holding fixtures.
2. Move tools to the work, or work to the tool.
3. Operate latches and clutches, etc.
4. Provide prime power for fractional horsepower operations.

Senacon Air Motors are readily adapted to building up efficient, improvised machine tools for a wide range of operations such as milling, power sawing, power punching, broaching . . .

GET MORE WORK DONE FASTER . . . BETTER . . . MORE ECONOMICALLY

Every tool engineer can see at a glance what the Senacon Motor can do to speed production, increase operator efficiency, reduce fatigue. Operating movements can be reduced as much as *half* . . . no skilled "feel" for tool advance is required . . . automatic features permit utilization of extra time for hand-finishing of workpiece when required. These are only a few of the many outstanding advantages of using Senacon Motors for controlled auxiliary power on large machine tools, and for prime power on smaller units.

Senacon Air Motors are available in stroke multiples of ½" from 1" to 18", priced within the range of the smallest shop. Write—today—for new Catalog illustrating and describing Senacon Air Motors, and showing actual applications in industry. It's free!



7 EXCLUSIVE SENACON AIR MOTOR FEATURES

1. **Compact *integral* air valve.**
2. ***Normal-positioning* valve—readily adjusted for normal piston advance or normal piston retraction.**
3. **Valve lever mechanism adjustable to operate from *any angle in any plane.***
4. ***Dual exhausts*—provide selective utilization of individual air blasts.**
5. ***Beaning of individual exhausts*—gives selective control of rate of piston advance and retraction.**
6. ***Auxiliary block valve*—permits manual operation of mechanism when desired.**
7. ***Central, angle or swing* mounting of motor, as desired.**

Two Senacon Air Motors operating a highly efficient straddle milling unit improvised from salvaged parts.

SMITH-JOHNSON CORPORATION

BENDIX BUILDING — LOS ANGELES, CALIF.

PNEUMATIC MACHINE *Senacon* TOOL DEVICES

SPEED PRODUCTION WITH AIR POWER

TO THE

SUPERINTENDENT

OF PRODUCTION

The demand for Ramet tools is unprecedented. The importance of conserving vital materials cannot be overemphasized.

You, as an armament manufacturer, can help the war effort by conserving the life and efficiency of your cemented carbide tools by seeing that the key men in your plant are cognizant of the primary rules for the care of tools. Please note the outline shown in panel on the right.

We suggest that you route this page, using the form at the top, to the men in charge of this very important division of your production department.

For the instruction and to help remind your machinists, in the proper care of carbide tools, we have prepared a large jumbo size wall poster, four feet high, which can be hung on the wall of your tool room.

Copies of this poster can be obtained without cost, by writing the Vascoloy-Ramet Corporation, North Chicago, Ill.

RAMET "5 METHOD" COMPLETE TOOL SERVICE

1 STANDARD TOOLS are complete tools, ready to use, in a choice of 10 styles, 3 grades, and many sizes—164 tools in all. Ramet Carbide Tipped Standard Tools meet a majority of requirements for machining steel, cast iron, and all other materials, and are readily adaptable to special jobs.

2 MILLED AND BRAZED TOOLS have a Ramet Carbide Blank brazed in place. All grinding is done by customer. Any size or shape of shank or grade of blank is obtainable in this classification.

3 TOOLS TO ORDER cover any style or shape of tool made to customer's order. Ramet Cemented Carbide Blanks are brazed in position and tool finished ground ready to use.

4 BLANKS OF RAMET Cemented Carbide of any shape, grade, or style all obtainable for the customer to make his own tools. A large variety of sizes in two styles and any of the three general purpose grades are available as standard blanks.

5 TANTUNG offers the ultimate in increased production where cemented carbides cannot be used. It is available as standard tools in a wide assortment of sizes and styles.

NOTE *ROUTE TO ATTENTION OF:*

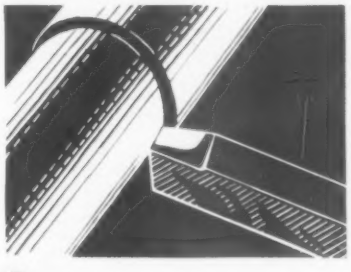
MR. _____ MR. _____

MR. _____ MR. _____

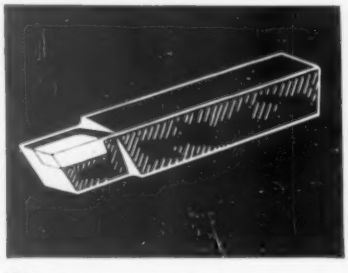
MR. _____ MR. _____

4 SIMPLE WAYS TO GET LONGER LIFE FROM YOUR *CEMENTED CARBIDE TOOLS*

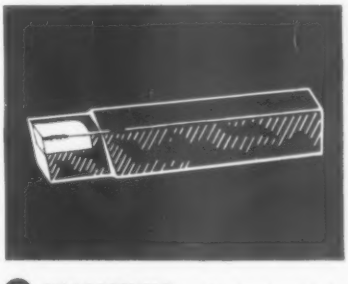
IF YOU FOLLOW THESE FOUR SIMPLE METHODS IN CARING FOR YOUR CEMENTED CARBIDE TOOLS, YOU WILL GET FASTER PRODUCTION, GREATER PRECISION AND LONGER LIFE FROM EACH TOOL



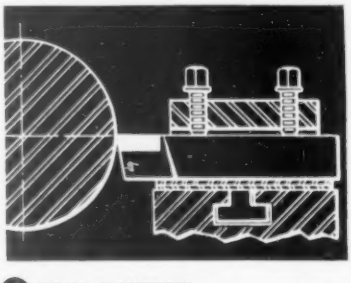
1 CRITICAL SPEED — The critical speed is an important factor in carbide tool life. Best results are obtained by running as close as possible to the critical speed.



2 CLEARANCE ANGLES — Use the minimum clearance angles required for the job. Unnecessarily large clearance angles prevent adequate support for the carbide tip.



3 SHARPENING — Tools should be reground at regular intervals, which are predetermined by careful tally of pieces per grind. Dull carbide tools are likely to chip, requiring extra grinding and excessive loss of tip material.



4 TOOL POSITION — As a rule the tool should be adjusted to the center. Support rigidly on a flat, solid surface, with minimum overhang.

VASCOLOY-RAMET CORPORATION

NORTH CHICAGO, ILLINOIS • DISTRICT SALES AND SERVICE IN PRINCIPAL CITIES

IN CANADA: Carbide Tool & Die Company, Ltd., Hamilton, Ont.

TANTALUM-TUNGSTEN CARBIDE

431

JUMBO WALL SIZE POSTER SENT ON REQUEST A reproduction of the above instructions, four feet high, without advertising, suitable for display on the walls of your tool room will be sent on request, without cost.

Are You Wasting Machine Capacity?

Get Peak Production with

TECO CARBIDE TOOLS...

EVEN with your shop working 'round the clock and your men and machines busy every minute . . . your production can be far from capacity. The real pay-off is in *pieces-per-day* each machine produces!

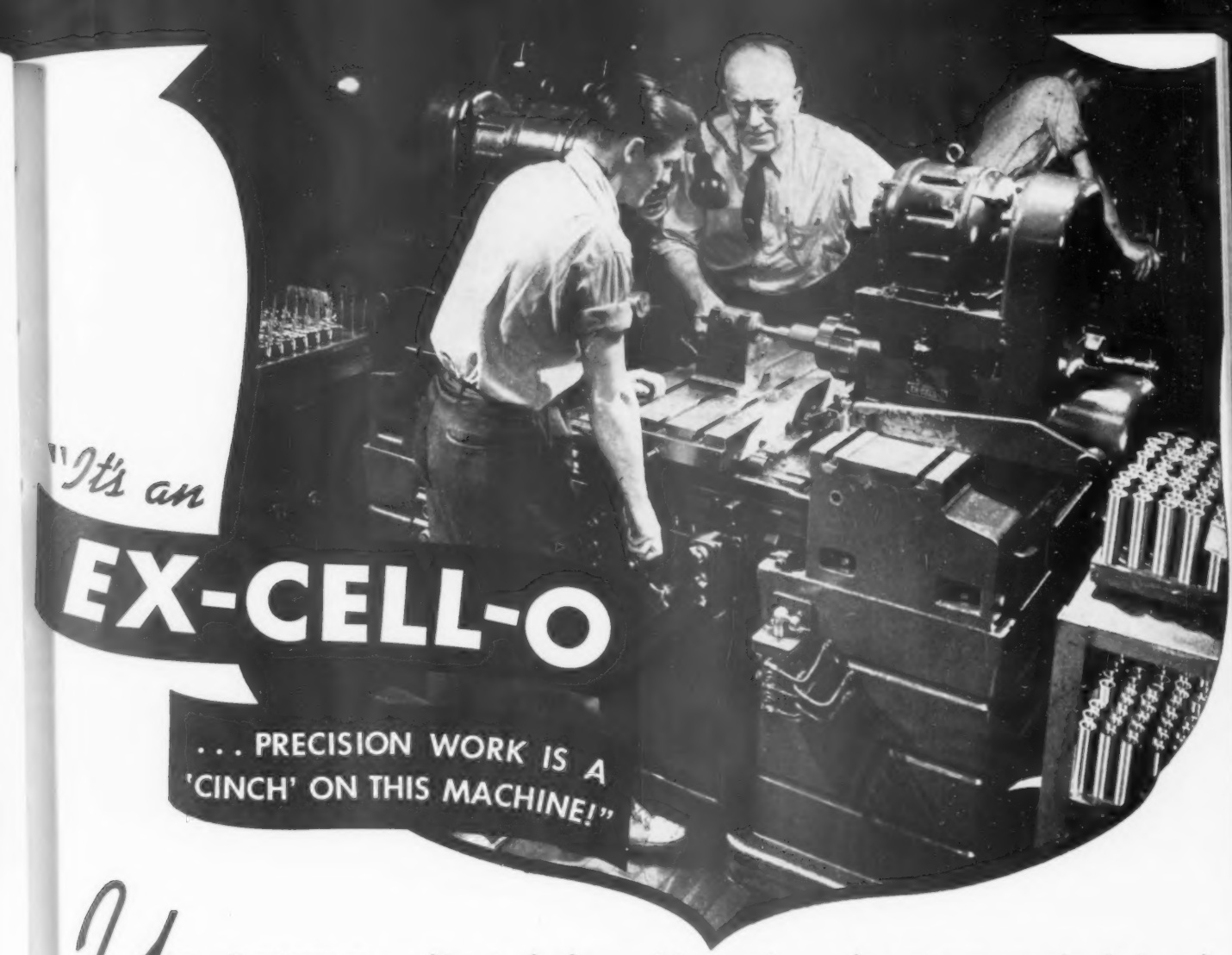
The extraordinary capacity of TECO Carbide Tools in turning, boring and facing, will increase your output per machine. Because of rigidly controlled hardness, density and uniformity, TECO Carbide Tools hold cutting edges and maintain accurate tolerances for longer runs — produce more pieces between grinds—reduce down time —cut at higher speeds. Try them and be convinced.

TECO
Carbide Blanks for PROMPT SHIPMENT
Standard grades styles and sizes.

Recently increased facilities have tripled our output of carbides and doubled tool production, permitting prompt shipment of grades and styles for practically every machining need.

TUNGSTEN ELECTRIC CORPORATION
570 39th Street, Union City, New Jersey
Branch Office 2906 Euclid Ave., Cleveland, Ohio
Representative: Architects & Builders Bldg., Indianapolis, Ind.

TECO *Pioneers in Tungsten Carbides for over a Quarter Century* **CARBIDE TOOLS**



"It's an

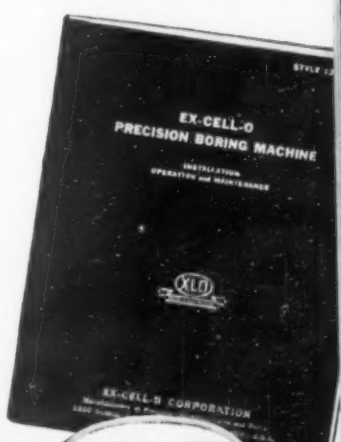
EX-CELL-O

. . . PRECISION WORK IS A 'CINCH' ON THIS MACHINE!"

YES, all *EX-CELL-O* machine tools do *precision* work . . . they are purposely designed and built that way. As a matter of fact, it's now common practice throughout the metal-working field to use *EX-CELL-O* as another word for precision. Take the machine tool illustrated here. It's one of nine standard styles of *EX-CELL-O precision* boring machines, thousands of which are doing 24-hour duty in practically every type of American war industry. They are performing a wide variety of machining operations—boring, turning, facing, grooving, chamfering—where tolerances are extremely close and the highest production is essential. Their flexibility in use, their compact construction, their smooth and easily-controlled operation, their great strength and extreme rigidity . . . all these standard features make every *EX-CELL-O Precision* Boring Machine a favorite with both operators and owners under today's strenuous production pace.

ear each of the four
nits of Ex-Cell-O in
troit fly three flags
. the Stars and
ripes, as always,
Army-Navy "E"
nnant, and the *first*
S. Treasury "Bull's-
" War Bond flag.

NOTE—If you are using one or more of your Ex-Cell-O Precision Boring Machines for short runs, need quick change-overs, or an all-round standard fixture, check into the added flexibility and time-saving advantages that an Ex-Cell-O Universal Fixture will give you. Work, fixtures and tools can be quickly, easily and rigidly mounted in any desired position on the vertical slide of this fixture and the slide may be set at any desired angle for boring, turning, or facing.



EX-CELL-O CORPORATION • DETROIT

To get best use of your Ex-Cell-O precision boring equipment, you should have the Ex-Cell-O Instruction Book. If you do not have it, write for free copy. State style of Ex-Cell-O machine you are using.

ecision THREAD GRINDING, BORING AND LAPPING MACHINES • TOOL GRINDERS • HYDRAULIC
WER UNITS • GRINDING SPINDLES • BROACHES • CONTINENTAL CUTTING TOOLS • DRILL JIG BUSH-
S • DIESEL FUEL INJECTION EQUIPMENT • R. R. PINS AND BUSHINGS • PRECISION PARTS

XLO

IN AIRCRAFT PRODUCTION

This Baker Machine Works on Exhaust and Intake Rocker Arms for Aircraft Engines.

Model 36-HO

Write today for complete information on this machine

This vertical CLEANLINE heavy duty single and multiple spindle drill with hydraulic feed, is set up to drill, counterbore, rough, and finish ream. Used by the manufacturer of one of the leading aircraft engines, this machine takes part in the manufacture of exhaust and intake rocker arms. In this case, it is furnished with an 8-spindle, fixed center multiple head and the base with a 40 inch diameter shallow type ball bearing hand index table.

BAKER BROTHERS, INC. TOLEDO, OHIO, U.S.A.

DRILLING • BORING • TAPPING • CONTOUR GRINDING MACHINES

BAKER

a New Guide

TO PRECISION MANUFACTURE

YOU will find frequent occasions to use this new PM Gage and Small Tool Catalog—just off the presses.

The book gives you complete information about PM Diamond Emblem Gages—for accurate and precise production control.

Also described are many types of small cutting tools—built to form metal in accord with today's accurate dimensional standards and close tolerances.

The PM Diamond Emblem on all of these gages and tools is your guarantee of initial accuracy and extra care used in finishing and hardening.

If you have not already received your copy of the new catalog, a request on your company letterhead will bring one to you.

PM CO

The PIPE MACHINERY COMPANY Cleveland, O.

GAGES • HOBS • MILLING CUTTERS • SPECIAL TOOLS

How to increase production Quickly

with these NEW DELTA POWER-FEED DRILL PRESSES

You can get more output from the same number of operators by utilizing low-cost DELTA Power-Feed Drill Presses. They permit operators to perform additional jobs while the power-feed works automatically and quickly pay for themselves. And here's important news: These new Delta Power-Feed Drill Presses are priced considerably lower than the customary price ranges for drill presses of this quality.

Many Outstanding Features

The unusual design of the Delta Power-Feed unit, which operates directly off the bottom drive of the motor instead of off the spindle, makes possible a wide range of feeds, from .0010 to .016 inches per revolution of spindle in the Slow-speed drill presses and from .0005 to .009 in the High-speed machines. Other special features include: 1. Quick traverse by hand from starting position to work; 2. Instant switching from power to hand feed and reverse without changing or removing parts; 3. Safety lock for preventing damage to drill press when power feed is disengaged; 4. Adjustable automatic stop and return.

This new line includes single and multiple spindle 17" units, in slow speed and high speed models, with table raising or head raising mechanisms, powered with either Delta or standard NEMA frame motors.

Write for SPECIAL BULLETIN

Ask your nearest Delta Industrial Distributor for specifications and prices on the new line of Delta 17-inch Power-Feed Drill Presses or write direct to us.

DELTA
MILWAUKEE

THE DELTA MANUFACTURING CO.
610-A E. Vienna Ave., Milwaukee, Wis.
Please send me Special Bulletin on the new line of Delta 17-inch Power-Feed Drill Presses.

Name .....

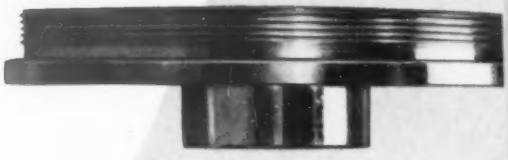
Address .....

City ..... State .....

If you have a job like this—
turn it on a Monarch!

Bombardiers don't care how bombs are made, just so we keep their racks full, ready to drop on the enemy.

That's why this manufacturer of base plugs put to work the Monarch lathes he already had, rather than wait for new machines that might be better fitted to the job.



First, the hub of the plug is turned on an older Monarch. Then, chucking on this hub with a 3-jaw chuck, and using the square turret with multiple positive carriage stops and clips on the cross-feed dial, our customer performs the following operations in one setup, on Monarch 18" Model BB lathes, as illustrated:

1. Face
2. Countersink hole
3. Turn O. D.
4. Turn shoulder
5. Neck
6. Chamfer back edge
7. Rough thread
8. Finish thread
9. Chamfer thread

Actual machining time—5 Min., 25 Sec.

The material is 1035 heat-treated steel, with a tensile strength of 70,000 pounds. A tungsten-carbide tool chases threads to finished accuracy. Production is on schedule—thus good old Yankee ingenuity keeps turning out Victory implements, faster for fighters.

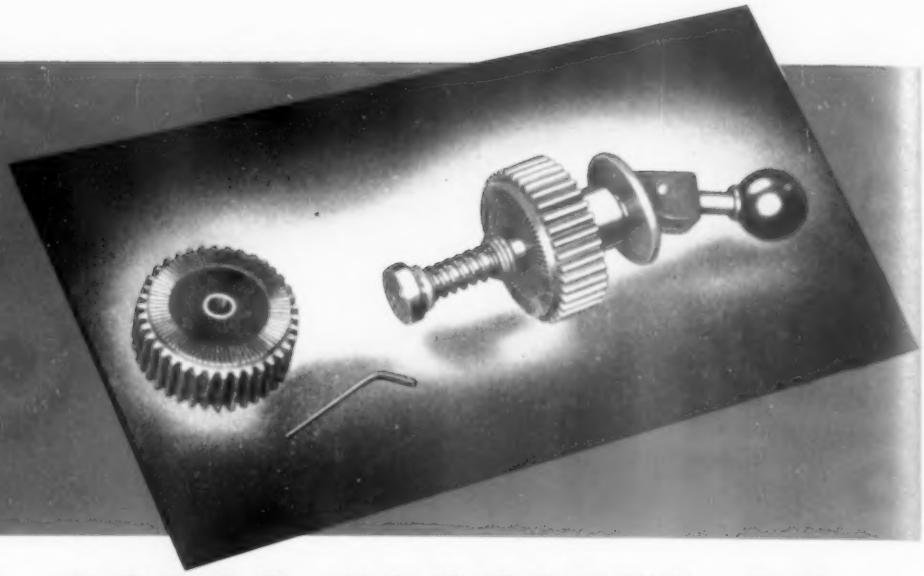
If you have a War production job you think might be done on a lathe, and don't quite know how to set it up, our field engineers will gladly help you.

THE MONARCH MACHINE TOOL COMPANY • SIDNEY, OHIO

MONARCH LATHES

COVER THE TURNING FIELD

QUICK ENGAGEMENT ★ GREATER PULLING STRENGTH



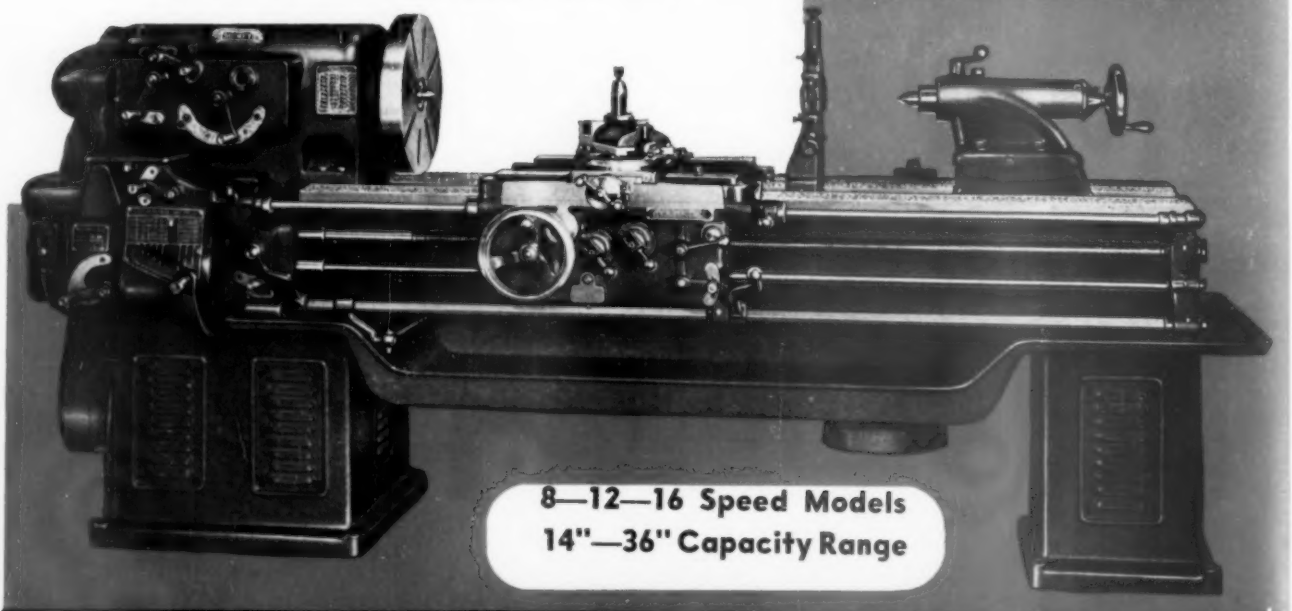
feature APRON CLUTCHES ON Sidney Lathes

Every unit contributing to the Speed and Power of Sidney Lathes is helping to step-up our War production to a point heretofore considered impossible.

The Apron Clutch illustrated is one of the advanced mechanical units incorporated in the design of Sidney Lathes. The serrated teeth are cut on entire face of engaging clutches to insure instant engagement and greater pulling power. A spring arrangement provides instantaneous release of feed, a highly desirable feature when working to close shoulder dimensions. There is also an adjustment to clutch jaws for required tension.

Complete details of all models are quickly available.

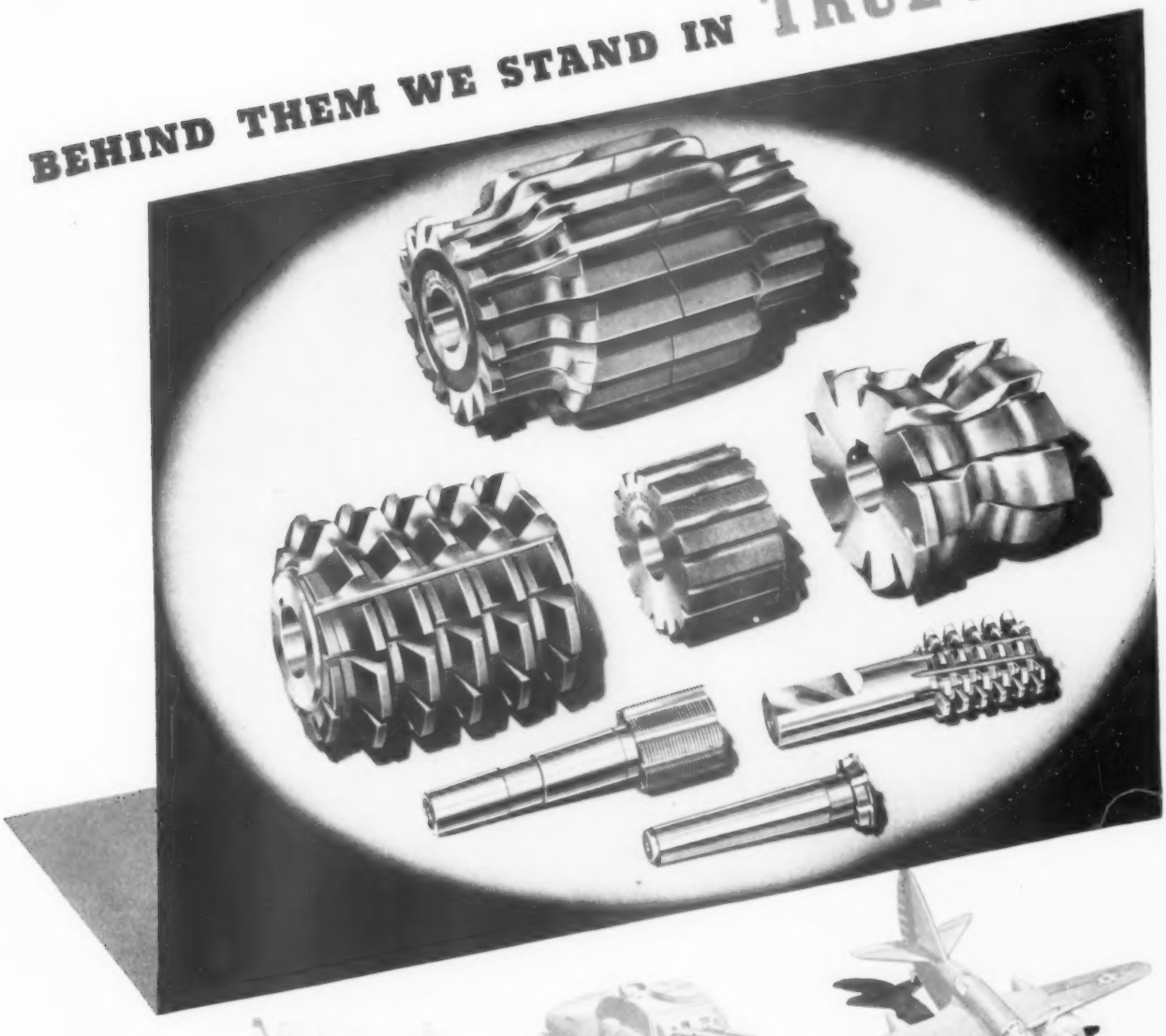
SIDNEY
THE SIDNEY MACHINE TOOL CO., SIDNEY, OHIO, U.S.A.

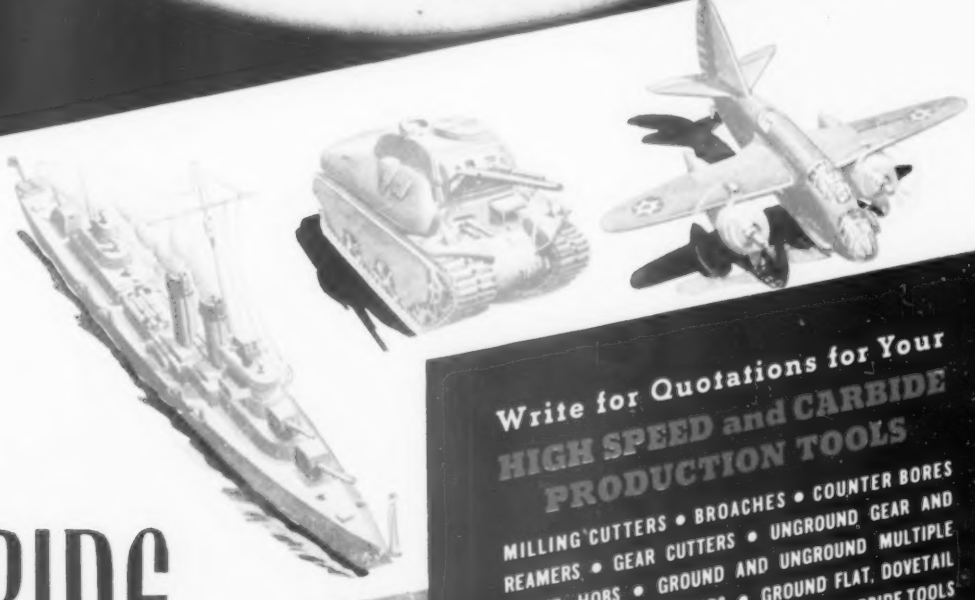


8—12—16 Speed Models
14"—36" Capacity Range

The SIDNEY MACHINE TOOL Company
Builders of Precision Machinery
SIDNEY ESTABLISHED 1904 OHIO

BEHIND THEM WE STAND IN TRUE FORM





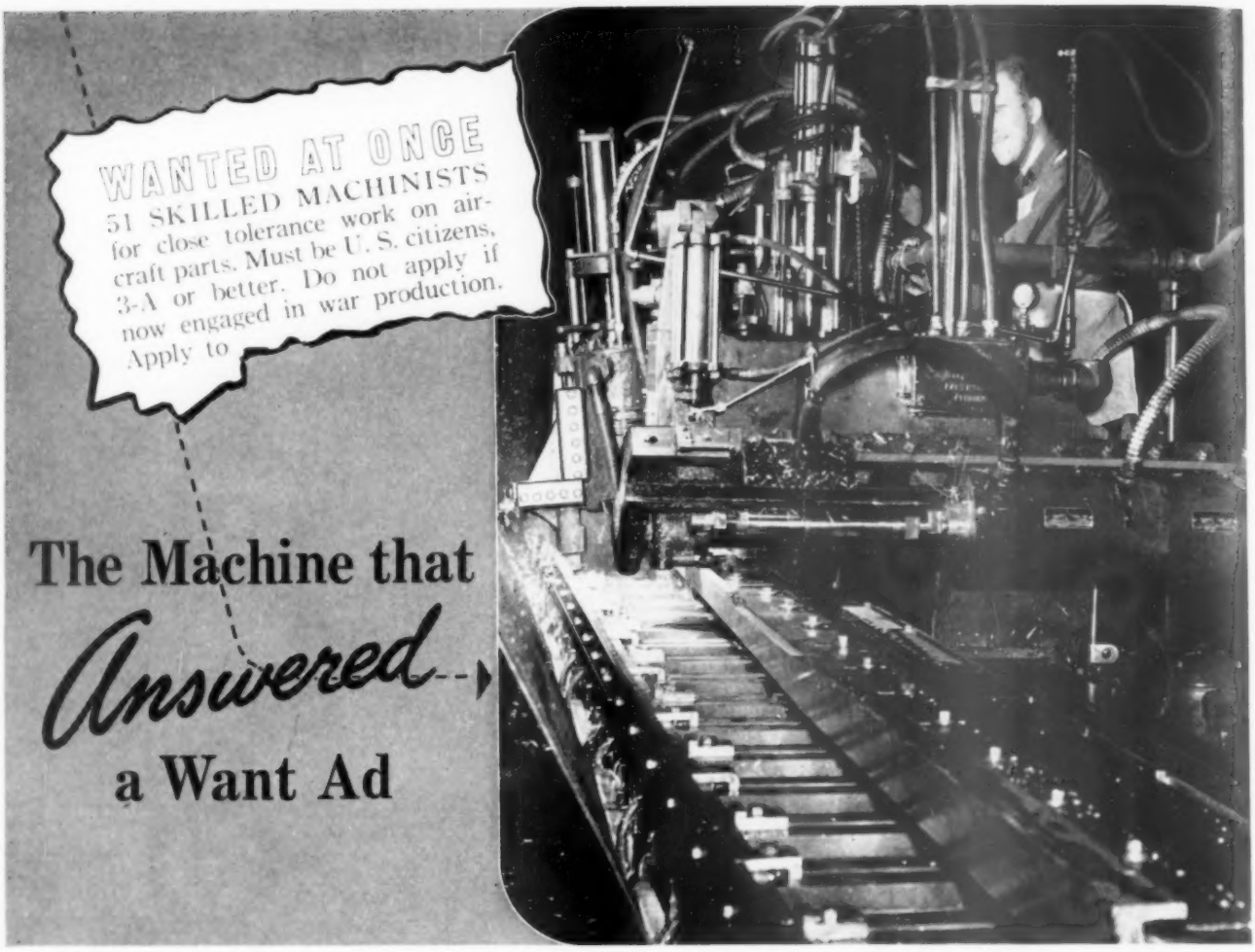
Write for Quotations for Your

HIGH SPEED and CARBIDE PRODUCTION TOOLS

MILLING CUTTERS • BROACHES • COUNTER BORES
REAMERS • GEAR CUTTERS • UNGROUND GEAR AND
SPLINE HOBS • GROUND AND UNGROUND MULTIPLE
THREAD MILLING CUTTERS • GROUND FLAT, DOVETAIL
AND CIRCULAR FORM TOOLS AND SPECIAL CARBIDE TOOLS

CARBIDE
TOOL COMPANY
OF CHICAGO

816 NORTH KOSTNER AVENUE, CHICAGO, ILLINOIS


WANTED AT ONCE
51 SKILLED MACHINISTS
for close tolerance work on aircraft parts. Must be U. S. citizens, 3-A or better. Do not apply if now engaged in war production. Apply to

The Machine that *Answered* a Want Ad

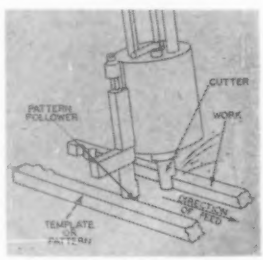
Shrewd manufacturers are getting valuable pointers for future use by watching the successful methods of today's aircraft industry. Despite a dwindling supply of skilled labor, plane production has been increased enormously. Here's the story of one part of that accomplishment:

Aircraft production engineers worked with Onsrud designers, and the result was a machine, operated by three men, producing parts as fast as 54 men operating 54 conventional machines could have done it. For each of such machines in operation today, 51 skilled machinists are available for other work.

More than just another automatic machine was required. A technique—a basic method—new to the field of metal working was involved. In Onsrud machines, the cutters are guided by templates, or patterns, and not by mechanically moving gears and cams which must be painstakingly set and constantly checked. Add to this the principle of high-speed cutting made practicable by Onsrud developments, and you have what has been called a "production miracle."

Today's production problem is one of finding alternates for non-existent skilled labor. Tomorrow the emphasis will be on the greatest possible production efficiency. For metals, plastics and wood, Onsrud machines—new in concept and proved in performance—combine these requisites and bring you tomorrow's methods today. ONSRUD MACHINE WORKS, INC., 3900 Palmer Street, Chicago, Ill. Sales offices in all principal cities.

Onsrud



Unique Onsrud design assures precise following of any pattern placed in the machine. The relationship between cutter and pattern-follower being rigidly fixed, surprisingly close tolerances—far beyond any practical demands to date — are held in the work.

MACHINE TOOLS AND METHODS FOR TOMORROW'S PRODUCTION

TOOL ROOM WHEELS ARE "WEAPONS FOR PRODUCTION"

. . . use them wisely!

1. MAKE SURE YOU ARE USING THE RIGHT WHEEL. Grinding wheels are made to a variety of exacting specifications. And there is *one* correct wheel for *each* tool room job. Given the necessary data, a grinding wheel manufacturer can give you a wheel in the right grain, grit, grade, bond, shape and size to meet your grinding conditions exactly.

2. MAKE SURE YOUR GRINDING SET-UP IS RIGHT. Manufacturer's recommendations should be carefully followed on wheel speed, work speed, wheel traverse, rate of infeed, proper coolant, etc. Only the correct balance of these factors gives you the full advantage of properly specified wheels.

3. MAKE SURE GRINDING WHEEL IS CORRECTLY MOUNTED. To give the best service, the grinding wheel must be properly balanced and correctly mounted. This must be done painstakingly to make sure the wheel is in perfect balance and runs true without vibration or wobble. Where operators have difficulty doing this, supervisory instruction should be sought.

4. MAKE SURE GRINDING MACHINE IS IN GOOD CONDITION. Bearings should be snug, foundations firm and every care taken to keep the machine as free from vibration as possible. The inspections and servicing necessary to maintain a grinding machine in tiptop condition will be paid for many times in longer wheel life, better work and higher production.

CARBORUNDUM
REG. U. S. PAT. OFF.
ABRASIVE PRODUCTS

THE CARBORUNDUM COMPANY • NIAGARA FALLS, N. Y.

Sales Offices and Warehouses in New York, Chicago, Philadelphia, Detroit, Cleveland, Boston, Pittsburgh, Cincinnati, Grand Rapids

(Carborundum is a registered trade-mark of and indicates manufacture by The Carborundum Company)

Here is a *Portable* Coolant System

. . . with large volume, fully controlled flow

CONTROLLED FLOW from 10 to 1000 Gal. Per Hour

SPECIFICATIONS

CAPACITY:	MOTOR:
Pump, 1000 G.P.H.	¼ H.P.—
Tank, 40 Gals.	1725 R.P.M.
Size, 16x16x36 in.	Ball bearing.
PUMP:	**ST'D EQUIPMENT:**
Centrifugal; high stress casting; sleeve bearings.	Flow control valve. Handy motor switch.

The New Gray-Mills HI-VOLUME *Centrifugal Pump*

NOW you can have large coolant-volume and high flushing capacity in a *Portable Coolant System.* Wherever you want the advantages of using coolants you can have them—on *all* your equipment—for *all* metal working operations like: grinding, honing, milling, cutting, tapping and threading.

The new Gray-Mills Hi-Volume Centrifugal pump, scientifically designed, specifically to handle coolants, will easily deliver 1,000 gal. per hour, or a controlled flow of any volume down to 10 gal. per hour. Here are some other important features:—A relief valve eliminates pressure build-up—The tank is fitted with baffle plates, for forced settling of abrasives and chips, to keep the coolant clean—Rugged, simple construction assures long trouble-free service—Horsepower consumption is low because efficiency is high.

Write for complete details on the New Hi-Volume Centrifugal and learn how easily you can use it wherever you need large volume coolant flow.

If any of your production equipment is handicapped in not being able to handle coolants, the answer is a Gray-Mills Portable Coolant System. In addition to the Hi-Volume Centrifugal of 1,000 gal. per hour capacity there are other coolant system models with capacities from 50 to 165 gal. per hour. We have the answer to your coolant system problems!

OTHER MODELS

Heavy Duty "A" Series 75 to 165 G.P.H.

Standard 50 to 130 G.P.H.

GRAY-MILLS

COMPLETE PORTABLE COOLANT SYSTEMS
FLO-RAC COOLANTS, PUMPS AND FITTINGS

GRAY-MILLS CO., 235 W. Ontario St., Chicago, Ill.

Specify HARDINGE COLLETS

FOR ACCURACY AND DURABILITY

The name HARDINGE on a collet is an accuracy and durability guarantee. When ordering collets only, or when ordering collets with lathes and milling machines of any make or size, specify HARDINGE Collets—they cost no more than other collets.

The stamping on the face of a HARDINGE Collet indicates that the finishing grinds were made after hardening the collet to assure concentricity.

Accuracy with durability comes from special steel, uniform heat treated threads, hardened surfaces for gripping or bearing, and spring temper for proper operation.

Write for HARDINGE Bulletin No. 41

Bulletin No. 41 clearly shows the styles of collets adapted in your lathes and millers. It lists the standard collets with general dimensions for identification, it gives normal round, hexagon, and square capacity of standard collets. It shows how all of your lathes and millers may be adapted for collets. Attractive prices are listed for round, hexagon and square hole sizes. It gives the location of collet stocks in Elmira, Hartford, New York, Rochester, Cleveland, Detroit, Chicago, Los Angeles, and San Francisco.

HARDINGE BROTHERS, Inc., ELMIRA, N. Y.

Gets into tight spots !

LOOK at that O.D., and you'll know why Apex stud setters get into hard-to-reach places with such ease and precision—even in the hands of semi-skilled workers. These simple, trim, clean-cut stud setters have small body diameters for their capacities. They are extremely easy to adjust for length of thread on stud and maintain proper adjustment in service. Simple design plus ample ruggedness and toughness make them fine tools for either hand or power applications. Four different sizes will set studs up to 1¼". You can get them with Morse taper, hexagon, T-handle and male or female square drive shanks, or combination T-handle with female square for use with a torque wrench. Write for Bulletin No. 101 for all the facts.

APEX

THE APEX MACHINE & TOOL CO., DAYTON, OHIO

Manufacturers of friction tapping chucks, quick change and positive drive drill chucks, vertical float tapping chucks, parallel floating tool holders, power bits for Phillips, slotted head and Clutch Head screws, hand tools for Phillips and Clutch Head screws, aircraft universal joints, plain and universal joint socket wrenches.

IT'LL TAKE PLENTY OF *Scrap* TO WIN THIS FIGHT!

3 Million Tons of iron and steel scrap are wanted every month . . . Are you doing your part to help America win her battle of production?

CONSERVATION AUTHORITIES RECOMMEND THESE 8 STEPS TO GET IN THE SCRAP

1 Put some one individual in charge of scrap in all departments of your business and GIVE HIM AUTHORITY TO ACT.

2 Comb the plant and yards for dormant scrap, abandoned equipment, old boilers, pipe, moulds, obsolete dies and parts, material now being destroyed which has salvage value.

3 Survey all plant equipment, particularly idle standby or discarded machines, with a view to applying or converting them to useful production.

4 SEGREGATION:
Identify, classify and segregate scrap and supervise its handling to avoid contamination. This will increase its value.

Provide separate containers, clearly marked, tor each class of scrap material.

Repair or rework worn or broken cutting tools Keep unusable small pieces and turnings segregated. Even high speed steel grinding dust is valuable.

Dismantle discarded equipment promptly into its components—electrical, fastenings, lumber, etc.—so that these parts may be utilized or scrapped.

Sort blanks, short ends, cut-downs, clippings, etc., for possible reuse for smaller parts made in the same or other departments.

Recover and reclaim used cutting oils, lubricants, surplus paints and spray finishes.

Sort sweepings and miscellaneous waste to recover scrap values.

5 Constant reminders in the form of posters, illustrations of right and wrong methods, pay envelope enclosures, house organ publicity, etc., are potent aids to the conservation program.

6 Release for scrap, obsolete engravings, electrotypes, and standing types for catalogs, forms and advertising material.

7 Inspect all refuse to detect avoidable waste and excessive rejections. Educate production executives to correct such conditions at the source.

8 For information and assistance on special phases of conservation and salvage communicate with Industrial Salvage Section, Conservation Division, War Production Board, 9th Floor, Washington Gas Light Building, Washington, D. C., or with nearest regional office

The metallurgical experience of our technical staff is available to aid you in these and other technical phases of metal salvage.

KEEP SCRAP MOVING INTO WAR PRODUCTION!

THE INTERNATIONAL NICKEL COMPANY, INC. 67 WALL STREET NEW YORK, N. Y.

THE 4 ABILITIES

GRAPHITIC STEEL HAS ALL FOUR

Graphitic Steel will give you greater ability to produce for Victory now and profits in Peace.

MACHINABILITY

If we gave you results of our own tests, you might think us prejudiced, so we leave it to Graphitic users to tell you from unsolicited letters in our file—"Graphitic Steel machines at least 25% faster than other tool and die steels."

DURABILITY

Again we resort to our letter files. Day after day, users write us and tell us that Graphitic Steel out-wears other steel, particularly where abrasion is a factor.

AVAILABILITY

It is readily available in all tool steel sizes to those who are working on vital Victory contracts.

PRACTICABILITY

Less fabrication cost; more pieces per die or tool; good delivery—all this adds up to practicability.

HELP ASSURE VICTORY

Buy War Bonds. Conserve Rubber. Eliminate Unnecessary Travel. Use the Telephone Only When Important. Salvage All Scrap and Waste Material.

THE TIMKEN ROLLER BEARING COMPANY, CANTON, OHIO

Steel and Tube Division

TIMKEN

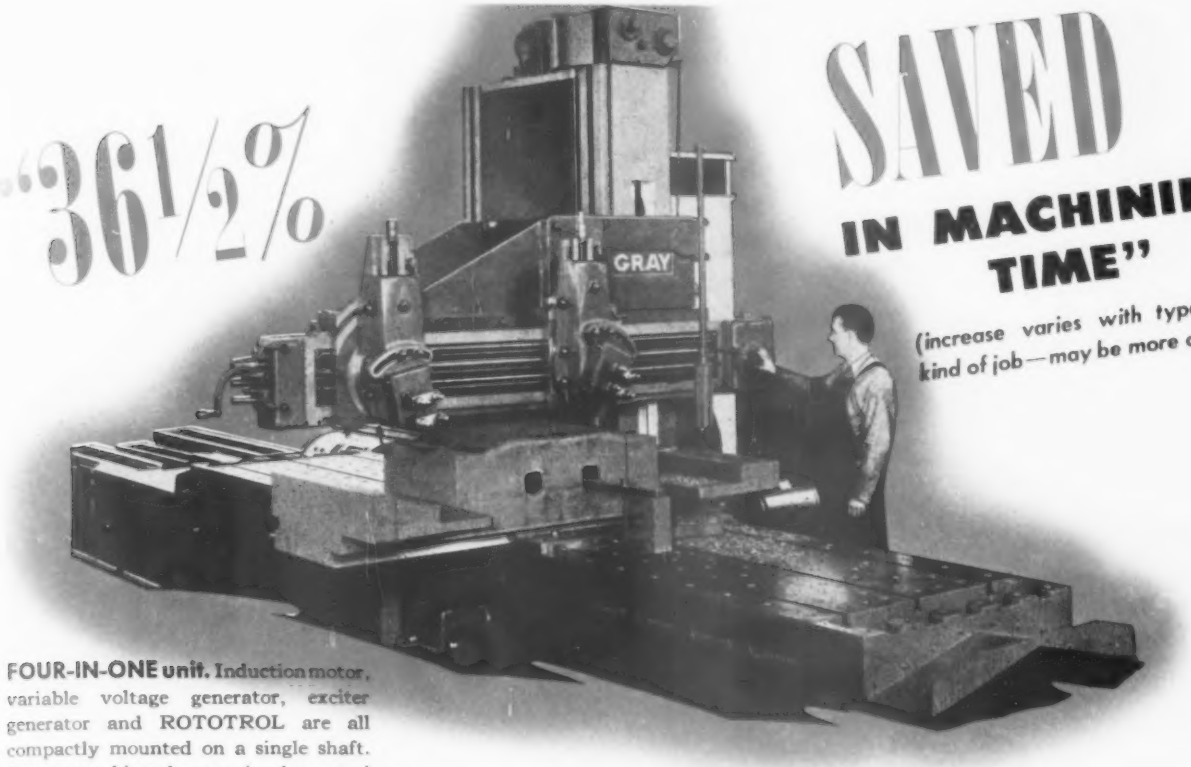
TRADE-MARK REG. U. S. PAT. OFF.

GRAPHITIC STEELS

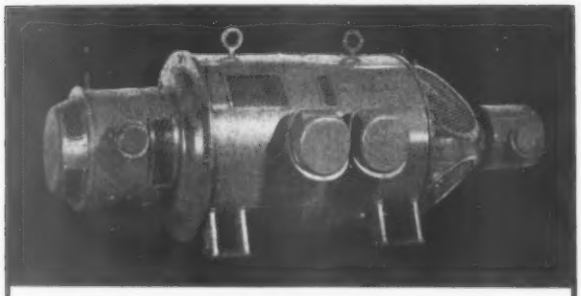
Manufacturers of Timken Tapered Roller Bearings for automobiles, motor trucks, railroad cars and locomotives and all kinds of industrial machinery; Timken Alloy Steels and Carbon and Alloy Seamless Tubing; and Timken Rock Bits.

"36½% SAVED IN MACHINING TIME"

(increase varies with type and kind of job—may be more or less)



FOUR-IN-ONE unit. Induction motor, variable voltage generator, exciter generator and ROTOTROL are all compactly mounted on a single shaft. Separate cabinet houses simple control panel.



WHAT THE WESTINGHOUSE VARIABLE VOLTAGE PLANER DRIVE DOES

- Gives more *cutting strokes* per minute—gives faster acceleration and deceleration—*speeds reversing time*.
- *Reverses accurately to a line*—provides accurate control for planing up to shoulders or in blind pockets.
- *Provides constant speed* at any setting over entire range, regardless of voltage or load fluctuations.
- *Cuts machine outages* for control maintenance.

...using Rototrol and Westinghouse

VARIABLE VOLTAGE PLANER DRIVE

"36½% of the machining time formerly spent on this job has been saved by substituting Westinghouse Variable Voltage Drive for the conventional reversing motor."

This report from the owners of the above 48" x 16' Gray open-side planer is typical of the results obtained with this simpler, faster, more accurate control.

Thanks to Westinghouse ROTOTROL—the versatile control scheme that permits faster acceleration and deceleration—the Westinghouse Variable Voltage Drive can speed up the reversing action of the table, stop it at the precise same point every time, and give MORE cutting strokes per minute. Wider speed range (40 to 1200 planer motor rpm) permits use of the most efficient cutting and return speeds to fit the job.

Get the full details on this perfected and proved production booster! Ask your Westinghouse representative for B-3064. Westinghouse Electric & Manufacturing Co.

J-21202

Westinghouse VARIABLE VOLTAGE DRIVES

OFFICIAL U. S. NAVY PHOTOGRAPH

Engineers say, "HARD CHROME PLATE IS THE SOLUTION"

Look around you! There are dozens of uses for hard chrome plating in war industry today . . . and every one of them is speeding production.

For example, in making gun parts or other armament, errors in machining can be corrected by building up the lost metal with chromium. Worn tools and dies can be reconditioned and salvaged. Machine tool parts, jigs, fixtures, gauges, and an endless list, can all be plated . . . fast and economically.

By the same token, you can use hard chrome plate to *reduce* the necessity of salvaging parts . . . by specifying it to surface new parts.

Serving New England & New York

Hard chromium plating resists corrosion and erosion, and adheres to base metals better than any other electro-deposited metal.

Applications of hard chrome to machine parts can vary from .0005 to any desired thickness . . . and hard chrome plate can be applied to any section or portion of a part.

If you're a present, or potential user of hard chrome plating, get in touch with Hartford Chrome. We have a continuous seven-day-week plating cycle, and can offer you the best delivery, keyed to wartime production. Standard of work applies to Naval Aeronautical General Specifications P-44.

OKAYED BY UNCLE SAM TOO!

The War Production Board has recommended that you salvage various tools, dies and imperfect articles through plating. Write for our circular giving full details.

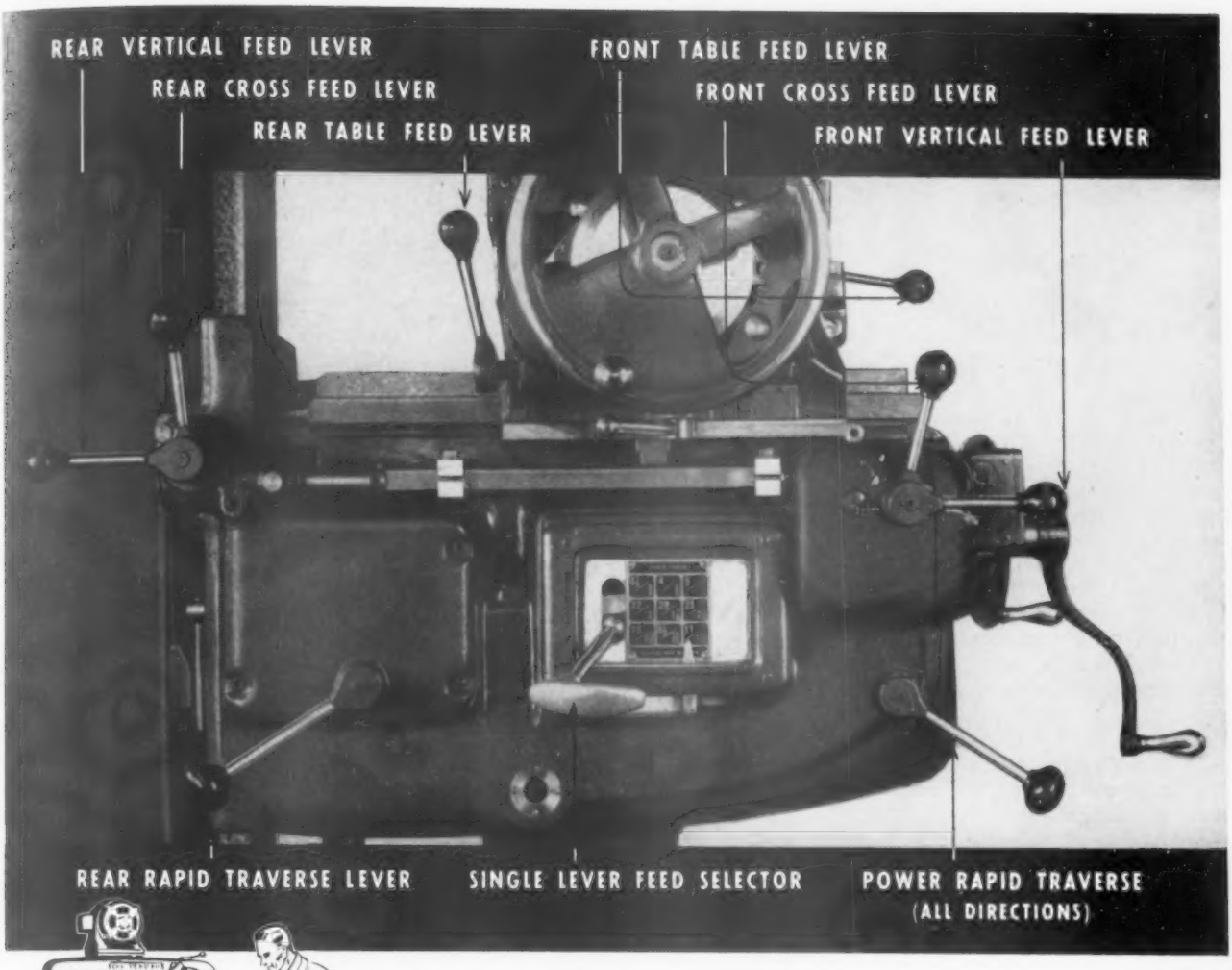
INQUIRIES FOR ESTIMATES WILL BE GIVEN IMMEDIATE CONSIDERATION

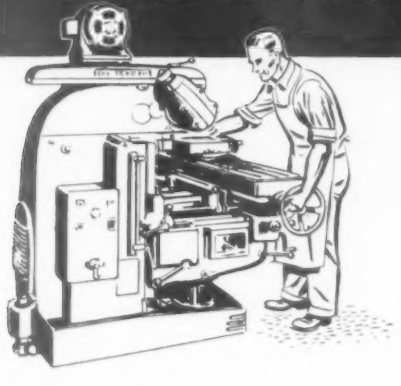
HARTFORD CHROME

CORPORATION

525 PARK STREET • HARTFORD • CONN

Licensed by United Chromium Inc.





VAN NORMAN CONTROLS ARE EASY TO REACH AND USE . . . Save Time and Lessen Fatigue

An operator working at the front or back of a Van Norman Milling Machine can readily reach a full set of power controls without going around to the other side of the machine. These controls are conveniently grouped and easy to use. They are *directional* in motion and remove any chance of confusion, because the levers are moved in the same direction in which the operator wishes to move the table, knee and saddle,—left or right, up or down. Illustrated bulletin sent on request. Write on your business letterhead.

ARMY E NAVY

VAN NORMAN

MACHINE TOOL COMPANY, SPRINGFIELD, MASSACHUSETTS, U. S. A.

HOW TO GET THE MOST OUT OF YOUR LATHES

No. 4 in a series of suggestions made by the South Bend Lathe Works in the interest of more efficient war production

Keep Your Lathes in Trim

The old proverb, "An ounce of prevention is worth a pound of cure", is as applicable today as when first expressed by some long forgotten sage. Lathes and other modern precision tools must be "kept in trim" if they are to give the long, trouble-free service that is expected of them.

Although the adjustments required to "keep the lathe in trim" are few and simple, they are important and should not be neglected. And even though the lathe is rigidly constructed and will stand some rough handling, it should be protected from unnecessary abuse.

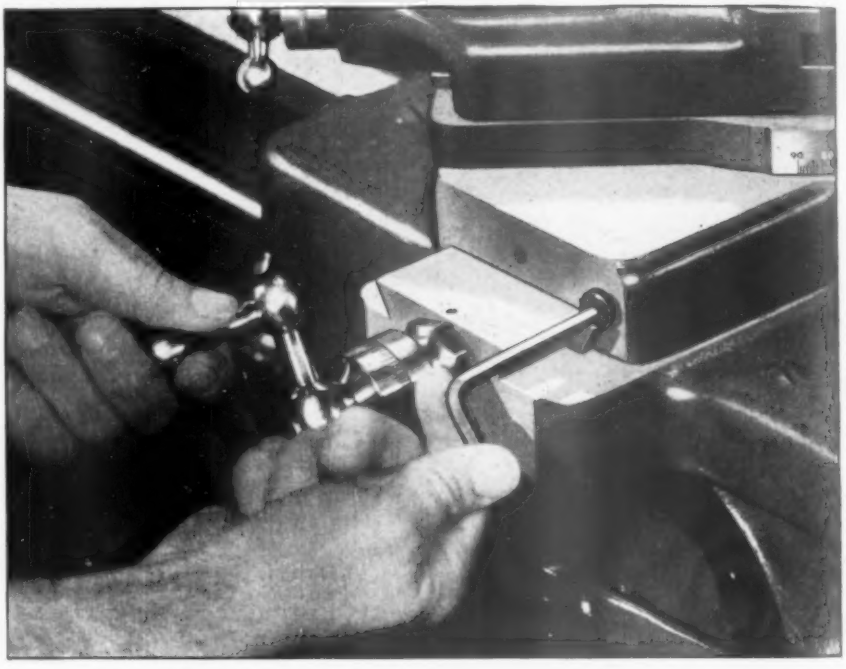
Power Transmission

Maximum efficiency as well as maximum production depends on the effective transmission of power to the lathe spindle. The motor, being the source of power for the lathe, should develop its full rated power and should operate at a uniform speed. If for any reason the line voltage drops below the rating for which the motor is constructed, the motor will not deliver full power. For this reason the current should be checked at the motor occasionally and the correct line voltage maintained.

To transmit the power from the motor to the lathe spindle efficiently, all belts must be properly adjusted. If the belts are too loose they will slip, and if they are too tight they will cause loss of power through friction. The belts should be just tight enough to transmit the required power without slipping. Precision belt tension adjustments provided on South Bend Lathes make it easy to keep the motor V-belts and flat cone pulley belts properly adjusted.

Dovetail Slide

All dovetail slides on South Bend Lathes are equipped with gibs which may be adjusted to eliminate play. When the adjustment of the dovetail gibs is neglected, looseness of the slides may cause the tool to chatter or may result in inaccurate work.



Adjust the dovetail gibs to insure accurate work

The gibs should be tight enough to assure the necessary rigidity, but not tight enough to bind and make the dovetail slides hard to operate.

Tailstock Adjustment

The alignment of the tailstock top should be checked frequently as any misalignment will cause the lathe to turn a taper. To test alignment, place a bar of steel, 1 inch or larger in diameter, between centers and machine two collars of equal diameter not less than 4 inches apart. Then, take a very light finishing cut across both collars without changing the setting of the cutter bit. Measure both collars with a micrometer. Any difference in the diameters indicates misalignment. Correct the alignment by turning the tailstock top set-over screws until both collars can be turned to the same diameter.

Don't Abuse the Lathe

Just because the lathe is made of iron and steel is no reason to expect it to stand abuse. Never use the lathe bed as an anvil. Don't use a crowbar to straighten a shaft between the lathe centers. Never rap chips out of a file by striking it on the lathe bed or tailstock.

Write for Bulletin H4

Bulletin H4 giving more detailed information on keeping the lathe in trim will be supplied on request. Also reprints of this and other* advertisements and bulletins in this series. State quantity wanted.

*H1, "Keep Your Lathe Clean"
H2, "Oiling the Lathe"
H3, "Installation and Leveling of the Lathe"

SOUTH BEND LATHE WORKS

South Bend, Ind., U. S. A. — Lathe Builders for 36 Years

Idle Cutting Tools!—Report For *ACTIVE DUTY!*

THE necessary diversion of a substantial portion of the available tungsten supply to war uses is causing, *and will continue to cause,* a shortage of High Speed Steel. As a result, manufacturers of cutting tools are not able to make full use of their facilities. Manufacturers of war materiel are, in consequence, suffering from needlessly long cutter deliveries, and are not able to make full use of *their* manufacturing facilities. This is a *very real situation,* not the product of someone's guess work or imagination; and it stems from an unavoidable shortage of tungsten. But, fortunately, there *is* a cure for that shortage — though it requires *your* cooperation and a willingness to give up something of value in order to help the other fellow . . .

You undoubtedly have a quantity of High Speed Steel milling cutters, drills, reamers, hobs, and other cutting tools in live storage — tools that are still good but have not been used for some time, and will not be needed in the near future. Please turn these tools in immediately as scrap metal! The steel companies can recover the vital tungsten from this material and use it to increase the supply of High Speed Steel in quick order. As has been said of some other items: "When we win this war, you can get plenty of cutting tools; if we lose it, you won't need them." Sure, it's asking you to sacrifice unused value — but that steel will be of a lot more immediate value producing shells and guns than gathering dust in your tool crib.

TURN IN
TO THE STEEL COMPANIES
ALL YOUR IDLE
HIGH SPEED STEEL
CUTTING TOOLS

V

Machine and Small Tool products of Barber-Colman Company are working in countless ways to forward the war effort. Our Field Engineers are at your service to assist in obtaining maximum efficiency and production from your B-C machines, hobs, cutters, and reamers. Call on this help whenever you need it.

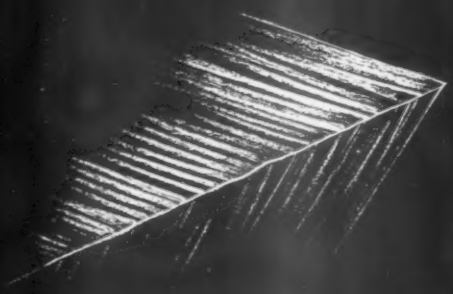
BARBER B-C COLMAN
PRODUCTS
MILLING CUTTERS, HOBS, HOBBING MACHINES, HOB SHARPENING MACHINES, REAMERS, REAMER SHARPENING MACHINES, SPECIAL TOOLS

BARBER-COLMAN COMPANY

General Offices and Plant 213 Loomis Street, Rockford, Illinois, U. S. A.

INCREASE TOOL LIFE
Many Times
by refined surface finishing

This cutting edge will dull quickly



This cutting edge will have long life

UNDER high magnification a cutting edge as ordinarily ground would show "hills" and "valleys" like the left-hand illustration. You can easily see that when the tool is put in use, the unsupported peaks are unequal to the load imposed upon them and quickly break off leaving flat spots that rub instead of cut. This places a greater load on the remaining edge which in turn fails quicker than it would if the edge were straight and the load equally distributed.

Norton engineers, working with prominent tool engineers, developed a method of producing the straight, even edge that means equalized loading and thus long tool life. For cutters and other multiblade tools it is a fine grain Crystolon wheel (37320-J8L or 37320-H8T 4) and for single point tools an Alundum wheel (38220-L9BE).

In many tool rooms these wheels are now producing a refined surface finish that is multiplying tool life many times—a tremendously important point today when tool steels are so scarce. A booklet "How to Increase Tool Life" gives you the complete story. Just ask for Form 986-TE.

NORTON COMPANY, WORCESTER, MASS.

New York Chicago Detroit Cleveland Pittsburgh Philadelphia Hartford Hamilton, Ont.

W-895

NORTON ABRASIVES

Any inexperienced person can operate an Ozalid Whiteprint Machine

MISS ARCHER was hired yesterday . . . and she's already operating the Ozalid Whiteprint Machine at top efficiency . . . making whiteprints of engineering drawings, charts, and letters in seconds.

This illustrates how Ozalid DRY DEVELOPMENT has revolutionized printmaking — transforming what was once a tedious job into a simple routine. You merely feed the original and the Ozalid sensitized material into the machine. Two quick steps— EXPOSURE and DRY DEVELOPMENT . . . and you have positive reproductions which are ready for immediate use in the shop or field.

Compare this simple process with blueprinting, which demands the services of more than one trained operator to check water sprays, potash baths, temperature of drying drums, tension of rollers . . . in addition to other wasteful operations which throw print production off stride.

Follow the example of thousands of manufacturers who have been convinced of Ozalid's superiority. Install a compact Ozalid Whiteprint Machine in your drafting room. You'll be sure of a "head start" in war production . . . and savings in labor and materials.

Write for "Simplified Printmaking," which completely explains the Ozalid Process.

SIMPLIFIED PRINTMAKING is an illustrated booklet containing valuable "know how" information. It shows how to eliminate unnecessary drafting; make prints with blue, black, maroon, or sepia lines on a white background; reduce trimming waste; make "new" originals for subsequent print production.

Ozalid Products Division

GENERAL ANILINE & FILM CORPORATION

Johnson City, N.Y.

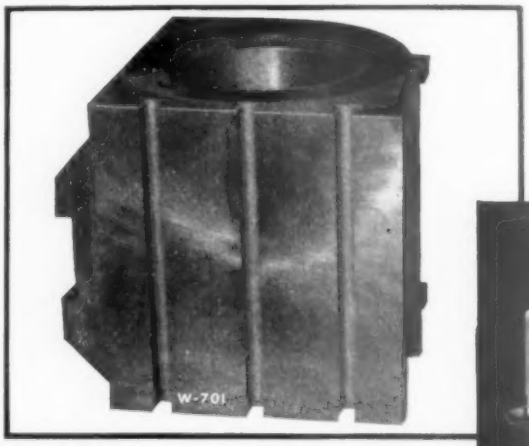
BLANCHARD

CHECK THESE ADVANTAGES OF BLANCHARD GRINDING

- ★ **Production**
  Adaptability
  Fixture Saving
- ★ **Operation Saving**
- ★ **Material Saving**
  Fine Finish
- ★ **Flatness**
- ★ **Close Limits**

★ . . . . . *Especially valuable on jobs like the one illustrated.*

"PUT IT ON THE BLANCHARD"



Semi-Steel
Stock per side 1/8"
Limits ±.005"
square .001"
to .0015" in 16"

No. Sides 6
1 piece (6
surfaces)
1 hour and
35 min.

THE SHAPER TABLE, 15½" x 16" x 16", illustrated here, is an excellent example of large, heavy work which may be ground with ease on a Blanchard No. 18 Surface Grinder with 6-inch extended column. These tables come to the Blanchard as rough, semi-steel castings. Six sides are ground, 1/8" stock being taken off each side.

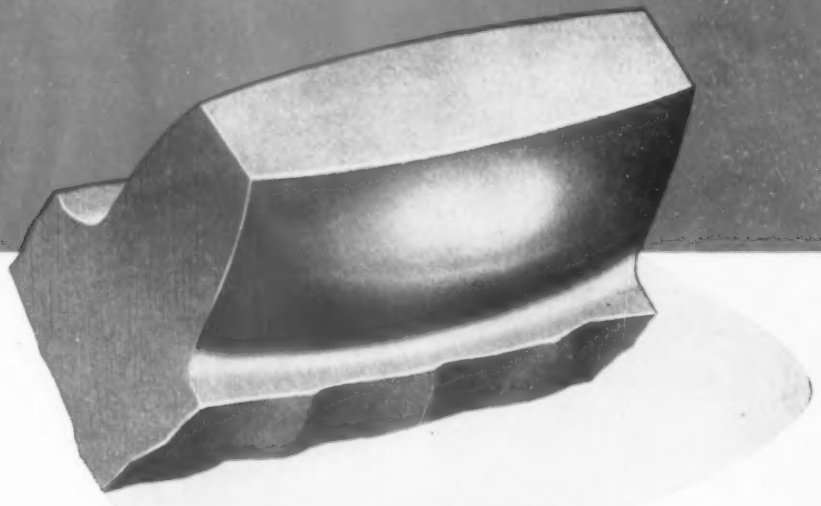
The BLANCHARD MACHINE COMPANY

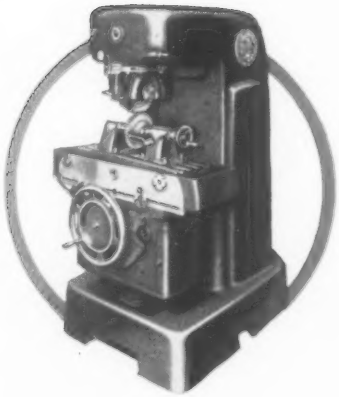
64 STATE STREET, CAMBRIDGE, MASS.

Send for your free copy of "Work Done on the Blanchard." This book shows over 100 actual jobs where the Blanchard Principle is earning profits for Blanchard owners.

THE ELLIPTOID TOOTH FORM

Eliminates End Bearing—Solves Difficult Aircraft, Military & Naval Gear Problems





End bearing—load concentration of gear teeth at one end or the other—has always been a source of gear noise and early failure. In conventional gear practice it can be avoided only by extremely close tolerances—difficult and costly to maintain and which retard production rate.

Gear teeth given the Elliptoid Tooth Form on the Red Ring Rotary Gear Shaving Machine avoid end bearing. The Elliptoid tooth is thinner at the ends—thicker at the center or wherever it is desired to locate the bearing.

Machining this tooth is automatic—a patented optional part of the shaving operation—adds nothing to the very low cost of shaving.

With this method, smaller, less costly gears will stand up better under the same loading. For example, Elliptoid gear replaces conventional bull gear increasing service life 400%. When used in same aircraft gearing, service life was increased 200%—in truck transmission it provided an increase of 300% in service life. Similar records made in many other cases.

Write for descriptive bulletins.

SPECIALISTS ON SPUR AND HELICAL INVOLUTE GEAR PRACTICE

ORIGINATORS OF ROTARY SHAVING AND ELLIPTOID TOOTH FORMS

NATIONAL BROACH AND MACHINE CO.

RED RING PRODUCTS

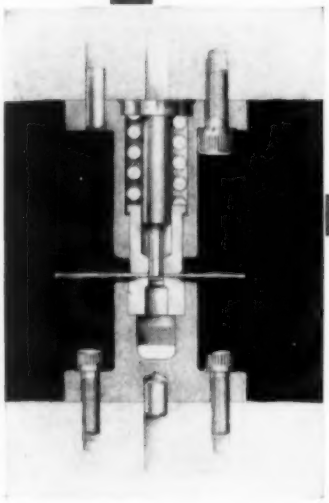
5600 ST. JEAN·DETROIT, MICH.

How to make multiple hole punching dies in ***"Nothing Flat!"***

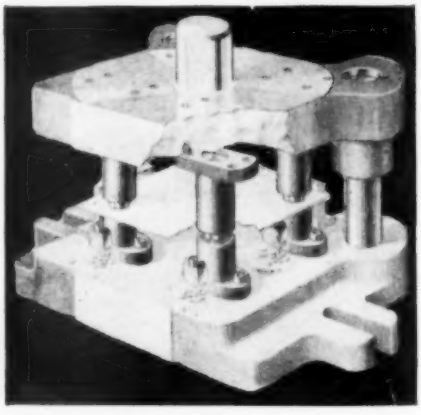
Buy a standard die set and add

WALES
COMPLETE CD UNITS

wherever you need holes punched



Above cross section of Wales CD Unit shows stripper spring and location of pilot pin in die holder.



Cutaway view showing four CD Units and back gauges mounted on conventional die set.

Wales CD Units are sets of punch and die units.

The punch unit half contains a punch with a pilot, a holder, a stripping spring and a guide. The die unit half consists of a holder with a slug clearance chute and a die. These revolutionary units provide new time saving and money saving features. The amount of assembly work is practically nothing.

Every punch and die is easily accessible for quick replacing of dulled parts without breaking down entire die set. "Down time" is practically eliminated with Wales CD Units.

TWO NEW SIMPLIFIED MOUNTING METHODS are fully described and illustrated in Catalog CD. Write for your copy today.

Remember, "There's Always Something New in the Wales Line,"—this month it's Wales "CD" Units. Keep posted by writing to—

THE STRIPPIT CORPORATION

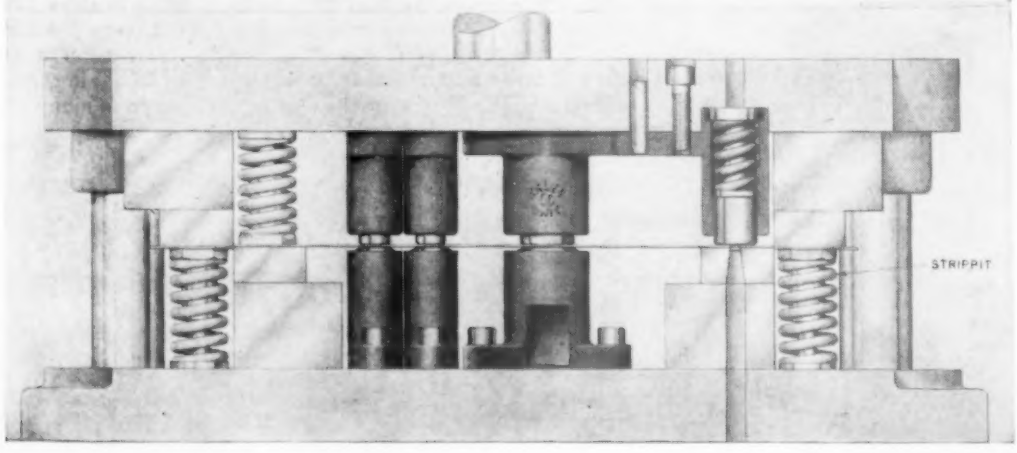
345 Payne Avenue

NORTH TONAWANDA, N. Y.

George F. Wales, President

Specialists in Punching and Notching Equipment

Cross section view showing typical die set with Wales CD Units.



Here's a machine that helps to relieve

MANPOWER SHORTAGE

SIMPLIFIED DESIGN of this modern, motor driven lathe eliminates many costly features not required for a wide variety of turret lathe work.

★ ★ ★ ★ ★ ★ ★ ★ ★ ★

Now Equipped with Automatic Indexing Turret

Concentrate highly skilled operators on complicated machines to handle only such jobs as demand top skill. Divert a wide variety of simpler operations to the Oster No. 601 "RAPIDUCTION" Turret Lathe which does the work equally well but with less experienced operators.

That formula, simple as it sounds, has proved to be an effective solution to the growing problem of "MAN POWER SHORTAGE" of highly skilled workers who can't be "duplicated" with novices crammed with a few weeks training.

But the same "novices" CAN be brought quickly to high standards of efficiency with the Oster No. 601 "RAPIDUCTION" Lathe. This modern, motor driven machine with its six-position turret now controlled by automatic indexing is doing multiple-shift work in scores of war production plants.

We're celebrating our 50th Anniversary by helping war production plants minimize the problem of MANPOWER SHORTAGE.

The form below is a convenient way of inviting us to "celebrate" in YOUR plant.

No Time Out to Celebrate Our 50th ANNIVERSARY 1893-1943

OSTER

THE OSTER MFG. CO., 2063 E. 61st ST., CLEVELAND, OHIO, U. S. A.

★ O.K. Oster. We're interested in the No. 601 machine. ( ) Send Catalog No. 601. ( ) Ask your nearest distributor to see us at once. (Check either or both of above requests.)

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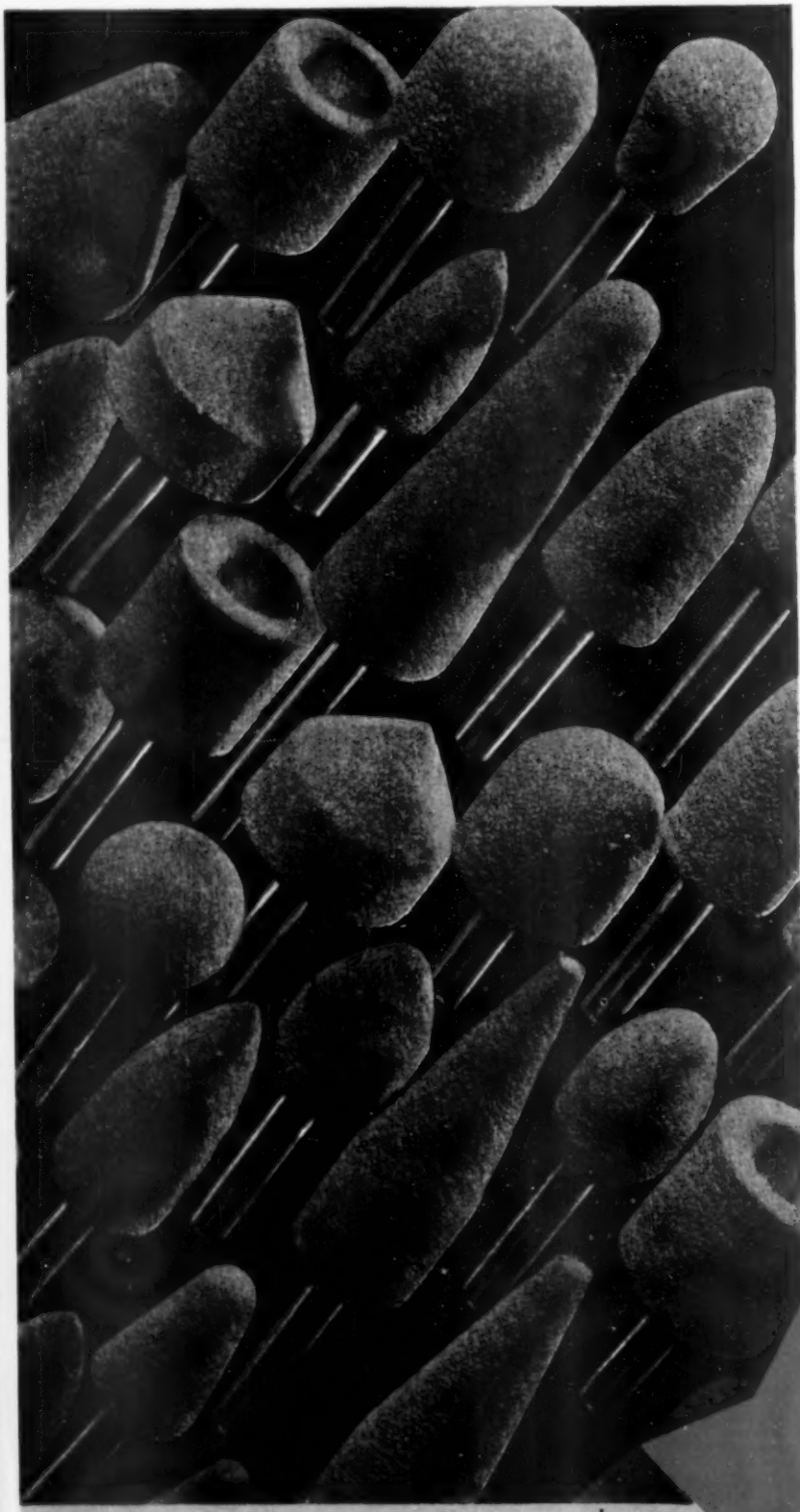
ADDRESS .....

CITY ..... STATE .....

STRATEGIC



As a Direct Hit on an Aircraft Carr

● We have fixed our sights. Our s
set-up is revolutionized. Now we
centrate on Mounted Wheels and
fied Grinding Wheels 3" and und
diameter — 24 hours a day, every

Our central location makes speedy
liveries certain.

● Wheels flow off our production
and into your plant in a swift, st
stream. Speed assured on all o
Count on us to meet bottleneck
gencies.

● Valuable man hours saved in your
There is no waiting for wheels.

● Customers — new wartime and
get the same high quality that has
maintained since we introduced the
Mounted Wheels 45 years ago. We
take care of all your requirement
wheels 3" and under.

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You should have our new catalog
illustrates in actual colors and size
largest line of Mou
Wheels made. Send
copy today.

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Name .....

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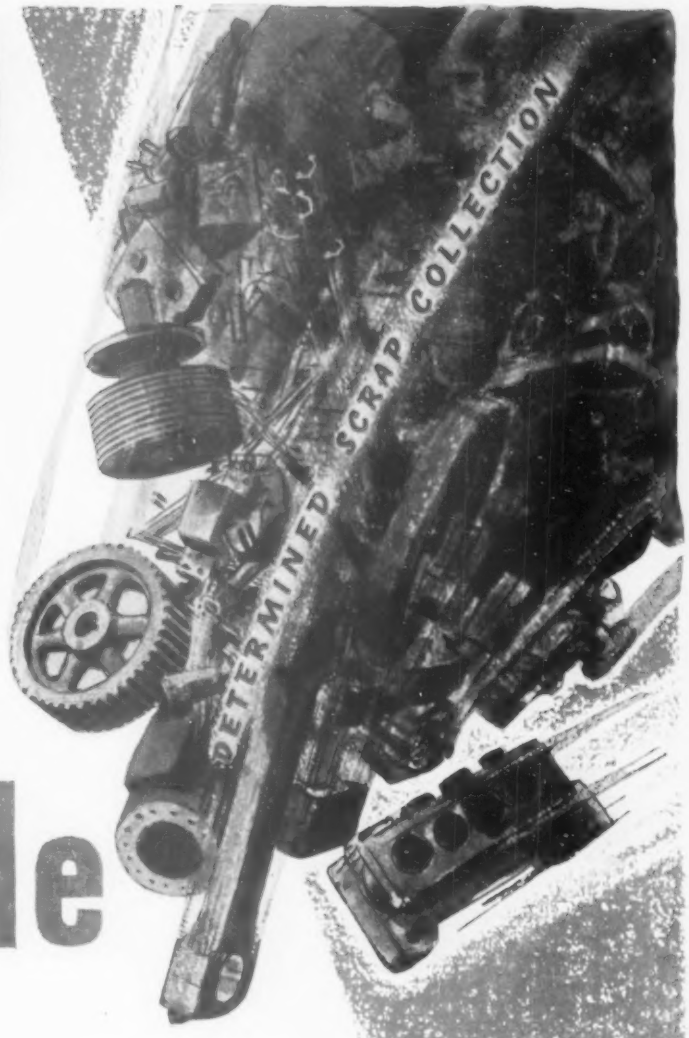
SCRAP

that smile



The scrap situation is serious and calls for drastic and determined collections to wipe the smiles from the faces of our enemies. Look first for the obsolete and obvious junk. Then look with a more searching and merciless eye for those vast quantities of border-line material — old materials and old equipment that are being kept for the remote possibility of future re-use. Consider carefully whether the possible re-use value outweighs the country's urgent need for scrap now. Don't stop with a short time "Drive" — scrap must keep moving to the steel mills in a continuous and ever increasing stream.

COPPERWELD STEEL COMPANY ARISTOLOY STEELS WARREN, OHIO

VERSATILITY *at your FINGERTIPS!*

Bench and Suspension Models —4 types of handpieces to choose from

---FOR COUNTLESS JOBS IN YOUR PLANT

Every Foredom Flexible Shaft Machine has this *exclusive Foredom feature*: quick interchangeability of four types of handpieces—making Foredom the most versatile, most adaptable general utility machine available today. For grinding, polishing, de-burring, finishing and all close corner work, Foredoms have no equal! That's why hundreds of war plants throughout the nation are equipped with Foredoms, using them for solving many production and maintenance problems, spotting them at convenient points about their plants for regular and emergency service. Among the great industries that now use Foredom Flexible Shaft Machines are Ford, General Motors, Bendix, Westinghouse, Warner, Allis-Chalmers, Remington Rand, Curtiss Wright and many others. Whether your plant is large or small. no matter what materials you work with—you will find that a Foredom can help you speed up production and save money.

Our catalog No. 388, just off the press gives the full story of Foredom Flexible Shaft Machines and shows their many uses in many different kinds of industries. Send for this catalog and find out how a Foredom can help solve today's production problems in your plant.

Excellent For Use On Irregularly Shaped Parts

Touching up Production Setups Without Dis-assembly

In Tool, Die, Mold & Patterns Depts.

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FLEXIBLE SHAFT MACHINES

SOLVE MANY PRODUCTION AND MAINTENANCE PROBLEMS

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Please send us your new catalog No. 388 showing the different uses of Foredom Flexible Shaft Machines.

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How to

HELP YOURSELF
HELP PRODUCTION
HELP UNCLE SAM

NEW
A new Lovejoy blade

SAVE
Still plenty of life left

SCRAP
Sell blades like this to Uncle Sam — he needs them

Lovejoy Milling Cutters, with *positive-locking* Lovejoy Blades, have been outstanding in their field continuously for the past 28 years. Now, more than ever, Lovejoy users are appreciating especially Lovejoy's advanced blade design.

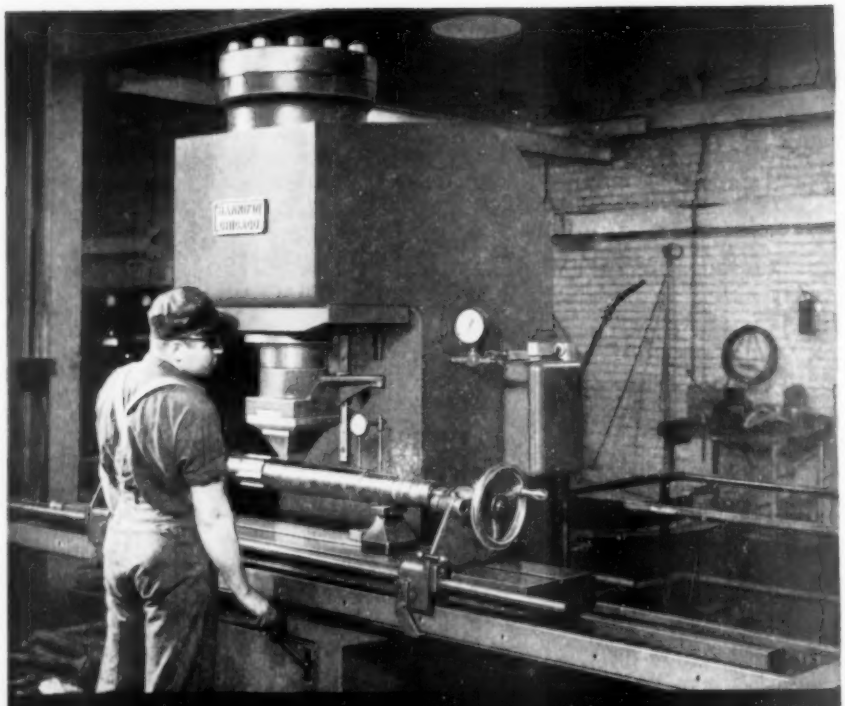
Lovejoy blades HELP YOU because they are *interchangeable* over a wide range of sizes. More than one-half the blade may be used. All standard sizes of blades in High Speed Steel, Stellite, Rexalloy, and Cemented Carbide blades are carried in stock for immediate shipment.

They HELP PRODUCTION because they last longer between grinds. They may be resharpened easily and quickly. They require less power on heavy feeds at high speeds.

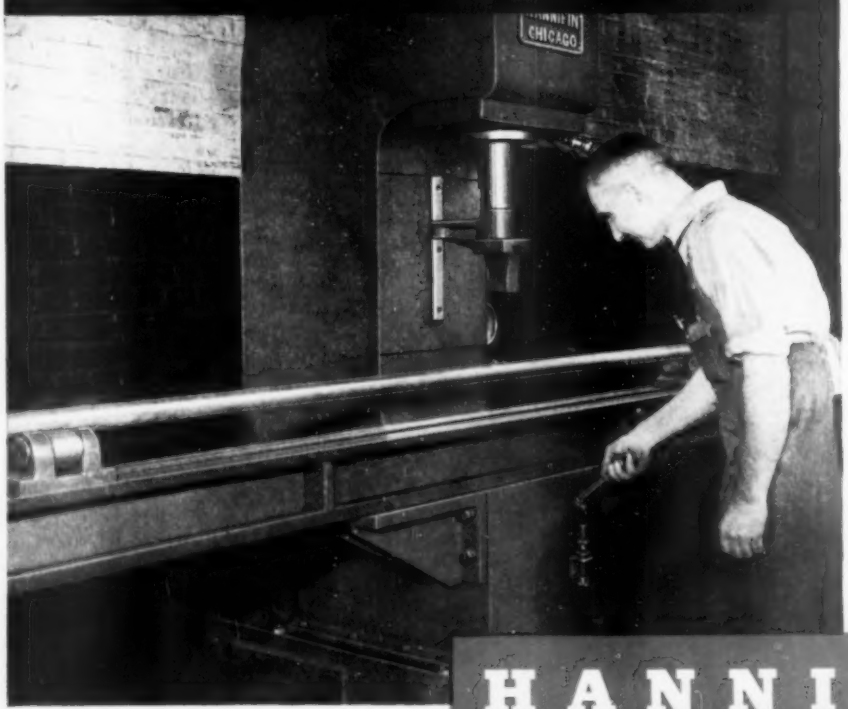
When your blades are ready to scrap, be sure to HELP UNCLE SAM by selling them to your junk dealer — remember, High Speed and other alloy steels are scarce — keep them in the fight.

Worn out Cemented Carbide blades may often be salvaged by using Lovejoy's retipping service — information on request.

LOVEJOY
TOOL COMPANY, Inc.
SPRINGFIELD, VERMONT, U.S.A.



Put straightening operations on a *faster* production schedule



(top) 75-ton Hannifin hydraulic press used for straightening large lathe spindles.

(bottom) 20-ton Hannifin hydraulic press with long table and long stroke, for a variety of production straightening work. Ram strokes are adjustable, to avoid unnecessary travel in production operations.

Fast, accurate straightening, whether a 20-ton capacity job or one requiring a 75-ton maximum, is immeasurably aided by the simple, natural finger-tip control available with Hannifin hydraulic presses. Sensitive pressure control, an exclusive Hannifin development, provides infinitely variable control of *ram pressures,* from a few pounds to full capacity of the press, in proportion to movement of the hand lever or foot pedal control. Because the operator gets any pressure needed with a push of the fingers, handling is simpler and easier. Operators quickly develop consistently rapid and precise production on straightening operations.

Hannifin hydraulic presses are compact, self-contained units with built-in motor driven hydraulic power. Many standard types are available for straightening, press-assembly, forming, and similar work, in capacities from 5 tons to 200 tons. Modifications in dimensions, speeds, and ram stroke are readily made to meet individual needs. Hannifin press performance can help you meet today's production needs. Consult Hannifin engineers, or write for press bulletins.

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HANNIFIN *Hydraulic* PRESSES

THE TOOL ENGINEER

T.M. Reg. U.S. Pat. Office JANUARY, 1943 Volume XII, Number 1

SCRAPE OFF THE BARNACLES

AS THE SLEEKEST VESSEL can be fouled by encrusted barnacles, so a nation can be slowed by red tape. There is positive proof that our ship of state has been slowed dangerously by the bureaucracy of "printed forms." The press publicises it, war workers at the Capital complain of it and go-getters chafe under its restraint. It slows engineering, hog-ties management and snarls production. That American industry is mass-producing war material at rates unprecedented in history does not alter the case; more could be produced were the impediments removed. That is the concensus of industrial opinion.

And now, while Congress investigates, Leon Henderson prophecies more red tape to come. Instead of relief, the situation is to be aggravated. We can't have that. In this age, with war waged on an ultra-modern scale, the odds will favor the most efficient of the contenders. Hence, we should streamline our entire war output, and Washington must set an example for the nation. Scrape the barnacles off the ship of state!

A MAN DIES, HIS WORK LIVES

AMERICA'S No. 1 industrial architect, septuagenarian Albert Kahn of Detroit, passes on. A shirtsleeve engineer, he carried on despite warnings to slow down. He worked and inspired, left behind him monuments — as great industrial plants — that are dedicated to human freedom. A man dies, but his work lives. Of such is the stuff of immortality.

NOW, FOR A FRESH START!

IN THE FIRST RUSH of war production, many conversion plants got off to a bad start. We do not refer to the manufacture of goods which could be produced by proven methods, but to those demanding new and untried processes. Typical of such processes is the welding of armor plate, the welding of assemblies previously riveted, or the machining of various new alloys which have proven the bane of experts in production. There was no precedent, in many instances only the sketchiest of working drawings from which to design tools. Yet, American industry *had to get going!* With little time for deliberation, accomplishments to date are, nevertheless, a tribute to industrial daring and tool engineering genius.

One result of rush was an inordinate cost of production. Manpower supplemented inadequate tooling, equipment and methods. But now, industrial manpower is being depleted as our armed forces expand, which means that production must increase, and, at decreased costs. The way to bridge these extremes is with improved methods and better tools. We have been through the worst of the production headaches, have definite ideas regarding cures.

Let us, then, apply those cures; let us attack our problems with freshened minds and quickened confidence. Like the athlete who sprints on after getting his second wind, tool engineers must make a fresh spurt toward their goal — a steady, uninterrupted flow of war material.

ORDNANCE SPECIFICATIONS

ARMY ORDNANCE ENGINEERS know that peace time designs for guns and tanks have not always permitted the ultimate in mass manufacturing practices or conservation of critical materials. Consequently, General Levin H. Campbell, Jr. has enlisted the cooperation of the men on the production front to correct this condition.

Any tool engineer with a legitimate "sob" can get action toward stopping waste if investigation shows that Ordnance standards will be preserved. Example of conversion to non-critical materials is told in the story on page 82 about the Ordnance departments development of glass gages.

Though but a few weeks in operation by mid-fall, the Conversion Unit of the Ordnance Department had received 1,100 suggestions. About half were general, half specific. All specific design recommendations have been thoroughly investigated and about 60 percent accepted.

Now that tool engineers have the break long prayed for, they must exercise wisdom in making suggestions. We may infer that specific design suggestions are preferred to ideas which cannot be pinned down to particular jobs. Further, saving critical materials or machine time is the main objective. Jobs are made easier only so that more production will result.

Let's not drop crackpot ideas in the suggestion box. We all have flashes of inspiration about what's wrong with specifications. Let's make sure that a new or different way will not sacrifice quality, that it will save materials or machine time. In other words, let's not burden the Conversion Unit's special corps of design engineers with unnecessary investigation. That would only discourage other Army and Navy departments from taking this progressive step. Finally, on high production, take advantage of the greater benefits of small savings.

Engineers are urged to submit their suggestions to any of the 13 Ordnance district offices, or to Major General T. J. Hayes, Ordnance Department, Pentagon Building, Washington, D. C.

ROY T. BRAMSON, *Editor and Publisher* JEROME S. WILFORD, *Managing Editor* ANDREW E. RYLANDER, *Technical Editor*
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Tool Conservation begins in the Tool Crib

A PLACE FOR EVERY TOOL...

In the conservation of tools, their proper care in the tool crib is just as important as their proper use. Tools misplaced, lost or damaged through poor housekeeping methods are out of production just as completely as those worn out or broken on the machine.

Note the conspicuous aisle and section locating discs, and drawer numbers. Corresponding symbols on the requisition, copied from a card index, enable even new employees to locate unfamiliar tools quickly.

Photo Courtesy Pratt & Whitney Aircraft

The direct labeling method is handy for departmental cribs or for the small shop.

Photo Courtesy American Bosch Corp.

and EVERY TOOL IN ITS PLACE

Increased production schedules mean more calls at your tool crib windows with a probability of more delays in handling "Window Traffic". Systematic layout of aisles, shelves, drawers and compartments will assure that every tool is where you want it when you want it.

• • •

GREENFIELD TAP AND DIE CORPORATION
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ARMY (E) NAVY

GTD GREENFIELD
TAPS - DIES - GAGES - TWIST DRILLS - SCREW PLATES

Flying Fortress Production Speeded by

Boeing Tooling System

To produce 30,000 parts, foresighted Boeing tooled-up with an eye to a depleted force of experienced man-power. This first aircraft producer to receive the Army-Navy "E" designed 100,000 tools to get the job rolling. It must still meet demands for two design changes daily

FRANK R. CANNEY

CHIEF TOOL ENGINEER
BOEING AIRCRAFT COMPANY

WITH MORE THAN 100,000 specially engineered and designed tools put into production since the President announced the national emergency, the Boeing Aircraft Company of Seattle now produces Flying Fortresses four times as rapidly as they did during the month before Pearl Harbor.

The one hundred thousand figure does not include commercially produced tools such as electric motors, drills, pneumatic hammers, lathes, presses and the like which are standard throughout the aircraft industry, nor the other Boeing made items classified as tools, such as production illustrations, templates, punches and the like which can be made without engineering design. Including these, the number of tools in use at Boeing would be well over a quarter of a million.

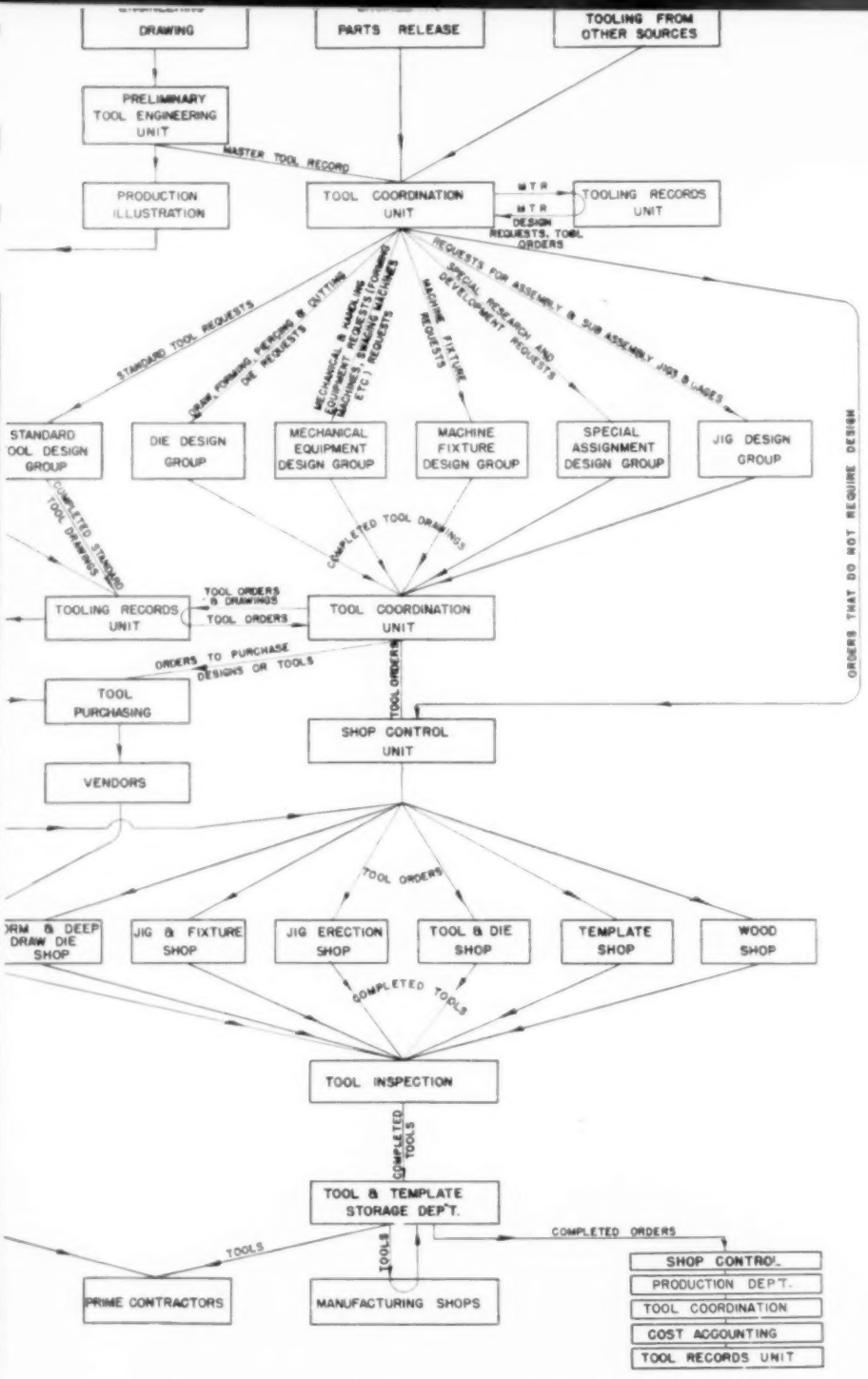
With more than 30,000 different parts, exclusive of duplicates and rivets, the Flying Fortress required a phenomenal amount of tool engineering to enable quantity production of this work horse of the Allies. Tooling design and construction took cognizance of the fact that the armed services would be depleting the experienced man power, which would necessarily have to be replaced by persons of inexperience in both factory work and aircraft work. The Pacific northwest, in the past, has not been noted as an industrial center. Production operations had to be simplified as much as possible.

Added to the task of tooling for production has been the constant tooling required to incorporate changes

Boeing tooling department heads confer on the tooling program.

Left to right: Frank Canney, chief tool engineer; W. S. Weimar, tool fabrication superintendent; Cal Jones, chief tool coordinator; Cal Easton, preliminary tool engineer, and Boyd Bucey, Boeing tooling superintendent.

Boeing Aircraft Photos



Master chart showing Boeing's control of tooling flow.

in the Flying Fortress. A combat aircraft, unlike familiar peace time products such as automobiles or stoves, cannot be produced in a frozen design. The lessons learned from actual tactical operations must be incorporated into the aircraft in a minimum of time, to keep American fighting men in the best of equipment. More than two changes a day are being incorporated into Flying Fortresses at the Boeing plant.

Boeing tooling men can forecast the exact ship on which the design change requested will first be incorporated. This unusual feat is accomplished by the tooling department keeping an accurate chart on the work scheduled on the various tool making machines.

Assume, for a moment, that a change will necessitate the use of a Keller machine. By noting the work program, it can be determined that forty-four hours of work are scheduled on each of the Kellers before the new change can be made. The tool designers have determined that the new change will require approximately five hours on a Keller. Or in roughly two and a half days, the change will be off the machine. By determining the amount of other work necessary to put the tool into production, and checking with the material department (if a new type of material must be used) to discover how soon the material can be obtained, the tooling men can notify production when the tool will be ready, and upon which ship the change will become effective.

Engineering cooperation

Boeing's tooling department is unique in the aircraft industry in that tooling engineers work in close cooperation with the aeronautical engineers, influencing design of the aircraft and parts toward productive methods most suited to manufacturing under existing conditions. The tool engineers assist the aeronautical engineers in arriving at the best possible breakdown of the aircraft for quantity production.

Directly responsible to H. Oliver West, Boeing's executive Vice-President, and in charge of production, Boyd K. Bucey, as Tooling Superintendent, heads Boeing's tooling organization. His responsibility is the planning, designing, fabrication, recording and storing of all special tools required for the fabrication, handling, and assembly of aircraft parts. He also is charged with the design of equipment, fixtures, and tools requested by the equipment engineer, the repair of equipment as requested by the superintendent of maintenance and the supplying of production illustrations (see TOOL ENGINEER, November, 1942) as requested by the manufacturing shops.

The tooling department is divided into three groups; tool engineers, tool coordinators and tool fabricators. Each of the groups is subdivided into specialized groups, which handle one phase of tooling, from preliminary engineering to the final touches of fabrication.

Briefly the outline of tooling procedure is that followed from the early stages of engineering design to completion and satisfactory operation of the tools required to manufacture the design. Heart of the tooling system is the Master Tooling Record. This is a multiple purpose form compiled by

the Preliminary Tool Engineering unit for each part, assembly and installation of the Flying Fortress. It lists all operations and tools required to produce each part. Engineering designs are checked by this unit through the various engineering stages prior to release, during which time an all inclusive check list covering tool simplification is filled out, making certain that the design is correct.

The master tooling record is compiled and immediately routed to the Tooling records Unit for the issuing of Design Requests which order necessary new tool designs, and tool orders which release tools not requiring engineering design for fabrication. On designed tools, all preliminary work possible is accomplished before the finished drawing is completed. When the drawing is ready, it is affixed to the previously prepared material and routed to the fabrication department. In many instances work is begun from the checkers prints, resulting in saving a considerable amount of time.

Production illustrations are made of the major master gauges which control tools relating to the interchangeable attachment points of the Boeing Flying Fortress. These data are compiled at the start of a contract in document form, together with a description of their usage, thereby becoming a guide to the tool designers and tool fabrication shops.

The design units are segregated into specialized groups to which design requests are routed, as directed on the Master Tooling Record. The danger of over-specialization in these groups has been avoided by a planned program of familiarization whereby group leaders have worked on all phases of tooling and are thereby able to coordinate their efforts to the fullest extent with the other groups. This is especially important in present day production where the utmost of interchangeability and coordination of attaching parts is required. For those persons who have recently rechanneled their efforts into tool engineering, Boeing's tooling department provides an extensive educational program which, in a large degree, provides them with knowledge which their experience in the past has not.

Date schedule

Each of the Boeing Tool Design Requests and Tool Order forms bear a "due" schedule which is assigned by the coordination unit. Dates are derived from delivery schedules issued by the production department with other deductions made for the time required to make, assemble, and install the parts. Time allowances are computed for the period required to fabricate the tool which determines when the design must be completed. With this date schedule established, the design time is thereby estimated and added to the design load for the group affected. If the actual design time is more or less than the estimate, corrections are made on the group load. Daily design and tool fabrication load reports are issued which facilitate predictions of man power requirements and efficient distribution of work.

Upon completion of tool drawings, Tool Orders are issued by the Coodination group ordering fabrication of the tool. Copies of these orders are routed to Timekeeping, Production, Tool Storage, Cost Accounting and other Boeing departments concerned.

Responsibility of the design units for the producing of satisfactory tools involves a great deal more than the release of tool drawings. Close liaison is maintained at all times between the design units and the tool fabrication shops to include refinements and eliminate possible tool troubles before design and release of tools for fabrication. The tool designers are kept constantly informed concerning current shop procedures.

The "Octopus". Designed by Boeing tooling experts to speed production of Boeing B-17 Flying Fortresses, this multiple-tubed machine cuts V-slots in the circumferential stiffeners which support the fuselage of the sub-stratosphere bomber. The hydropunch turns out work 45 times as rapidly as the machine which it replaced.

Two of the several Boeing-designed automatic spot welding tables which make skin panels for the Flying Fortress. Several such tables have been adapted to the needs of other plane builders.

Tool fabrication includes the following shops: Jig and Fixtures, Jig Erection, Tool and Die, Template, Wood, Tool and Template Storage, Form and Deep Draw Die, Plaster and Foundry and Tool Shop Liaison. All tool shops are responsible to the Tool Fabrication Superintendent. Tool orders are released to the Tool Shop Control unit where they are recorded and dispatched to the responsible shops. Shop load, status, and follow up records are maintained by this unit.

The Master Layout Unit of the aeronautical engineering department prepares master layouts of all contours and structures from which photographic reproductions are made on sensitized template stock. These photo templates form the basis for all the working templates produced by the Tooling Template Shop. Dies, jigs, form blocks and machine fixtures are thereby completely coordinated, permitting a maximum of operation in the make shops, and a minimum on the production lines. Another valuable asset resulting from the use of complete templating is the ability of the tooling shops or outside vendors to produce rapidly identical tools.

Upon completion of a tool and acceptance by the Inspection Department, the completed tool order is routed to shop control for clearance of records, thence to the tool and template storage shop for recording. This unit then notifies the production department that the tool is available.

A permanent tool inventory is maintained on IBM punched cards which contains a record of the tool part number, the part numbers produced by the tool, or on which it assists in production, and other pertinent information such as the type of tool, the quantity and the contract which it will affect, ownership, location and cost in hours and material. Rapid tooling reports or analyses are facilitated through the use of this system.

One important part of the Boeing tooling organization is known as the Standard Tools Unit, whose function it is to design the tools for many standard uses. These, generally speaking, are punches, clamps, milling cutters, reamers, bucking bars, dies of the adjustable type, punches and dies for power brakes and the like.

Utmost accuracy must be maintained at points of interchangeability. Here Boeing workers check a master gage (top) with a master control gage (bottom). Master gage checks jigs and work. Master control gage checks master gage.

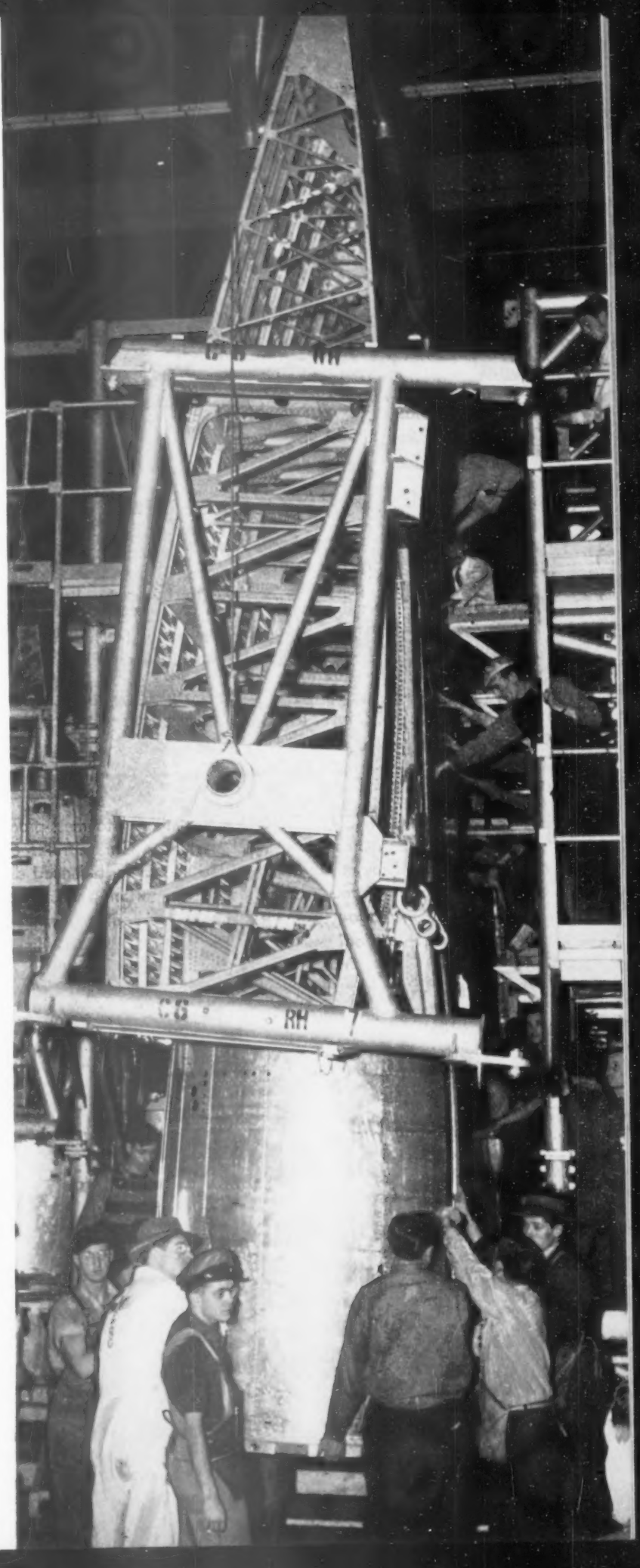
This tooling group lists completely all the standard tools, of which Boeing has over 7500 types, although the total number would be greatly in excess of that figure. A type of reamer would be listed, which may be available in twenty sizes. It requires three large looseleaf notebooks to make a set of Standard Tool Books, several hundred sets being located in various parts of the plant: tooling, aeronautical engineering, tool production shops and in the manufacturing shops. If one manufacturing shop has a job requiring a rivet bucking bar of unusual shape or size, formerly they might endeavor to make one, or order one made. The present process involves their looking in the Standard Tool Book, where undoubtedly one is listed which will cover the operation. A typical page of the Standard Tool Book carries a blueprint type drawing of the tool, a perspective drawing of it, and pertinent information.

If no such tool is listed, the shop orders one which is designed by the standard tool group, and when released, a page concerning this tool is added to all standard tool books.

Aside from tools, the Boeing tooling department creates machines to perform the tasks for which no commercially produced machine has yet been devised. One of the examples of this is the circumferential hydropunch, commonly called the "Octupus." Its job is to punch "V" shaped notches in the circumferential stiffeners of the Flying Fortress to accommodate the longitudinal stiffeners.

This machine can use up to nineteen dies, which are divided into seventeen punches and two cutoff dies, as well as stamping the number of the finished part on the circumferential stiffener. The dies describe a radius up to 190 degrees. The length of the radii can be varied to accommodate the diminishing sizes of the circumferentials. When first designed, this machine turned out parts forty-five times as rapidly as the machine which it replaced. Since then improvements have been made which enable it to produce all the circumferentials required on 2000 Fortresses in 100 days. From a design standpoint the most unique thing about this machine is the cutoff die which although the cutter is in a single piece, cuts with both an upward and downward stroke in a semi-floating arrangement, while the die is making a downward stroke.

THE END.



Largest of the Boeing tools are the three-story wing jig batteries. Here a Flying Fortress wing is being removed from the jigs, to be set on the Boeing wing installation line, where the wing will be completed, engines installed, cowlings, tubes, controls, deicer boots and gas tanks added.

Springfield Armory

FIVE MACHINE OPERATIONS ARE HELPING TO MASS-PRODUCE THE GARAND RIFLE

JEROME S. WILFORD
MANAGING EDITOR

JOHN GARAND, inventor of the rifle, has been among the engineers who have solved the tooling problems of this mass war production job. An Ordnance Department requirement is that a military weapon must be capable of being manufactured rapidly and economically, using the class of machinery, materials and labor available in time of emergency.

Of several tools which Garand has designed, to meet this requirement, one of the most interesting serrates a surface on the rifle receiver to provide positive locking action with a knob that is turned against the surface.

Design of the receiver calls for a serration within a circle, the grooves conforming with the radius of the circle, and being about half-an-inch long. This surface surrounds a hole within the ear of the receiver. Cutter and work piece revolve in planes perpendicular to each other, and the cutter turns within the plane of the radius. Speed of their revolution is synchronized with spacing of the teeth on the cutter so that the proper distance is maintained between the grooves. Teeth are staggered about .001 to compensate for the revolution of the work, and to enable them to cut a groove in conformity with the radius of the circle.

BROACHING A SLOT ON A RADIUS

AN INGENIOUS FIXTURE AND TOOL are used to broach a slot on a radius perpendicular to the depth of the cut. A 27-inch arm, traveling in a horizontal plane, pivots from one end on a vertical drive shaft, drawing a broach through an arc of 27-inch radius. The drive shaft is hydraulically actuated so that the finished operation is followed by the return of the tool to starting position, after broached receivers are removed.

The tool is built flat, is ground flat, and is stocked in the crib flat. Its design permits bending into position on the fixture. Close fitting guides maintain cutting accuracy and permit finely held tolerances. Thirty-one inserts of several teeth each make up the cutting edge. The purpose of the inserts is to facilitate repair after breakage, and to save scrapping an entire high-speed steel tool because of minor tooth breakage.

REAR SIGHT APERTURE

CLOSE MANUFACTURING TOLERANCES on the rear sight aperture of the Garand assure the weapon's accuracy. Opportunity for accumulated error in the use of the rifle, or any accurate weapon, is considerable. A few hundredths of an inch on the sight mean a variation of several feet in bullet accuracy.

Design of the tools for the production of this part showed several factors which go to make up excellent tool engineering. A high degree of interchangeability combined with large scale production is the result of good imagination. Basically, the part is an arc with a tongue projecting from one end, inward from the periphery. Teeth on the outer periphery allow definite adjustment for range. A hole through the tongue is the aperture which lines up with the front sight.

The arc has, roughly, a 2¾-inch radius. In designing the tools for production of this part, tool engineers visualized mass production of several parts simultaneously, considering the parts in their relationship to a circle. They discarded customary

HEAVY CUTS AND FINE PRECISION are combined to mass-produce for American infantrymen the accurate, fast-firing Garand rifle. Long broaches, mounted in heavy fixtures, and well-designed for balanced distribution of cutting power, are roughing and finishing important parts. Batteries of special-purpose "merry-go-rounds"—drilling, counterboring, reaming and milling simultaneously in one fixture—are fast filling tote boxes with finished parts for assembly. Thick chips are flooding in a stream of coolant from gangs of high-production inverted deep hole drilling machines. Thread mills are automatically locating to extremely close tolerances.

O.W.I. Photo by Marion Post

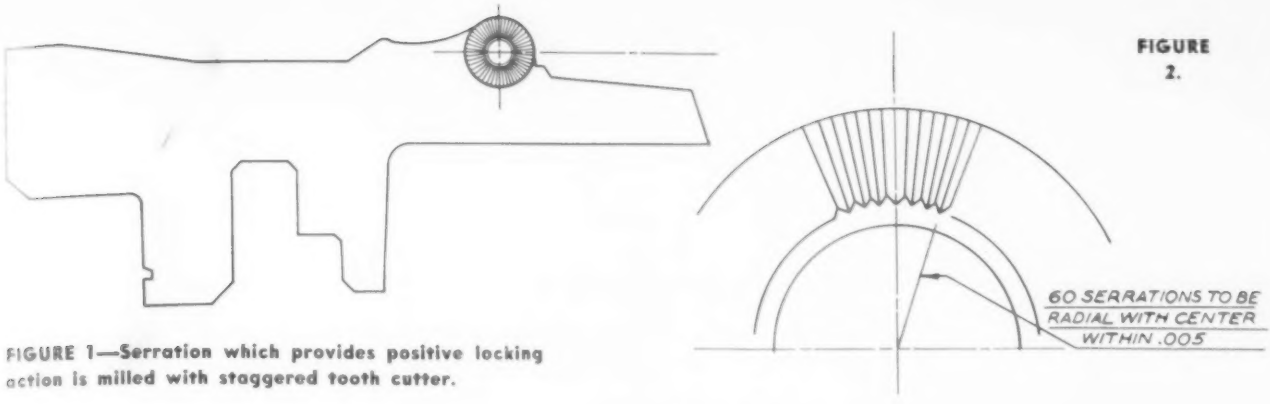


FIGURE 2.

FIGURE 1—Serration which provides positive locking action is milled with staggered tooth cutter.

methods of cold-forming from bar stock. Selecting seamless chrome-nickel steel tubing, 4½-inch OD and one-half inch wall thickness, they cut it into rings. The rings were normalized to 200-220 Brinnell hardness for machineability and ground to the thickness of the sight. Each ring contains stock for eight component parts.

Two operations illustrate the outstanding advantage of this method, allowing simultaneous machining of eight parts with one operation and one tool.

A horizontal broach removes stock on the inside diameter, rough forming eight tongues in one operation. A Fellows gear shaper generates eight series of teeth on the outside diameter. In addition, lathe, screw machine, milling, drilling and knurling operations are performed to complete the part. The major share of them are done before the ring is sawed into eight component parts.

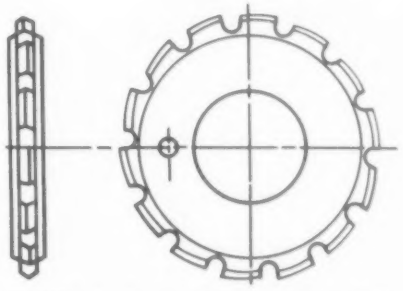


FIGURE 3—Staggered tooth pattern is necessary to produce serration on the receiver.

MILLING ON A DOUBLE RADIUS

RIFLE BOLT ACTION must be free. Part of this free movement is attained by guides developed to finely held tolerances, preventing binding or faulty action. The travel of the bolt through the receiver is guided by a channel milled in the side of the receiver. At one end, a positive lock is needed while the gun is fired. Setting and releasing the bolt at this position, however, must be done smoothly and quickly to permit rapid fire.

To provide the positive lock, the channel curves on a double radius. The degree of the curve is closely regulated to allow smooth action. The length of the channel is milled conventionally, but a special fixture has been designed for cutting the double radius. A plain mill with normal table travel is supplemented with a cam-actuated drive to revolve the work

ARMORY MEN AND MACHINES KEEP AND SOMETIMES SET PRODUCTION PACE

LIKE ANY OTHER manufacturing plant, the Springfield Armory has its tradition of men and machines. The austerity which has surrounded this citadel of American might in combat is caused by the necessarily stringent regulations on publicity. Yet its shops, drafting rooms and offices encounter and solve production problems much as in plants elsewhere in private industry.

The equipment of the armory has kept pace generally with improvements in commercial industrial fields. In fact, the peculiar needs of the armory often have preceded the development of satisfactory commercially built machines. When machine tool builders cannot offer solutions to armory problems, the armory engineers have worked out their own answers.

Of famous men who have served to raise the armory to its present high plane and added to its national reputation, there was Thomas Blanchard who, in 1822, designed a machine for turning gunstocks, the forerunner of all machines since used for the purpose. Blanchard is also credited with many models or forms of machines now used extensively in modern mass-production processes.

A prototype of Blanchard is John C. Garand, designer of the U. S. rifle, caliber .30, Mi, which is the new combat rifle replacing the Springfield M1903. He is unique in having developed the first successful semi-automatic military rifle, and he also developed machines for the manufacture of certain of its parts which enjoy the admiration of the machine tool and small arms industries.

fixture about 45° on a horizontal axis. The cam affords synchronization of back and forth table travel with the partial rotation.

The tool used on this job is a spiral end-mill. It is supported by a guide run through the end of the receiver. Tools cannot be reground. Undersize tools, set down to compensate, will cut only one side to design, in that the tool works to a double radius.

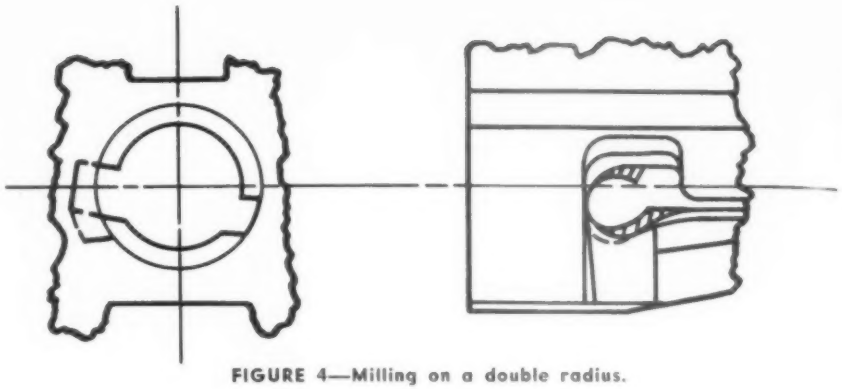


FIGURE 4—Milling on a double radius.

FOUR OPERATIONS ON THE HAMMER

A FIVE-STATION (including one for loading) Kingsbury machine has been developed to drill, mill, ream and counterbore and slot the hammer. All operations are simultaneous except the reaming and counterboring which are performed at the same station.

Station one drills the pin holes. Station two mills the exterior wall of the pin hole and mills a flat projection at the base of this wall. A spiral end mill, cam actuated to follow the curve of the vertical surface, performs this operation.

Station three is a two operation stop. The pin hole is counterbored by an inverted tool. Following this, it is reamed from above. At station four, a slotting cutter makes way for the trigger. Though both ends and two sides of the hammer are machined, the work fixtures are stationary on the automatically indexed table.

THE END.

Rear sight aperture forms an arc with a tongue projecting inward from periphery. Discarding customary methods of cold-forming from bar stock, engineers selected seamless chrome-nickel steel tubing, 4½-inch O.D. and one-half-inch wall thickness. Cut and normalized, rings are ground to size, tongues circular broached, teeth shaped on outer periphery before eight component parts are sawed apart and finished.

Tooling the Turret Lathe

A. E. RYLANDER
MASTER MECHANIC
MIDLAND STEEL PRODUCTS COMPANY
DETROIT PLANT

This is the second article in a series about metal cutting.

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WHILE the turret lathe is a key machine for the fast production of a great variety of bar, tube and chucking jobs, mechanical problems are considerably complicated by the fact that comparatively few production men, and as few tool designers, have more than a superficial knowledge of turret tooling and set-up. It's largely a specialty.

Then, too, we are dealing with new alloys and materials, and with new techniques which, with accelerating invention and soaring demand for ultra-fast methods, combine to create production problems quite beyond the ordinary. And to a great extent, these problems must be resolved with machines which, in many cases, are older by far than the workers assigned to run them.

This article, then, may be considered educational, treating the conventional jobs the while directing thought to unusual applications. In this connection, the parts shown are "camouflaged" composites of various product designs, a scheme which permits a broader treatment without conflicting with censorship restrictions. Needless to say, the applications shown are practical and provide for considerable variety.

TURRET OPERATIONS cover a wide range, from fine screw products and delicate parts to the machining of large and unwieldy castings. The machines, in turn, range from tiny Swiss screw machines to heavy duty production lathes, from simple hand feed to automatic, from single to multi-spindle and from horizontal to vertical. (The latter are usually known as chucking machines.) The field as a whole is a specialty, like gear cutting or broaching, with stock tools and set-ups covering a large range of the operations performed. For that matter, the larger manufacturers of turret machines, and many of the smaller, can furnish standard tools for almost any job, or they will work with the customer to effect the best possible tooling. The inference is, then, that one should leave a specialty to the specialists and depend entirely on stock tools.

That might work out satisfactorily if the product were standardized as well—*i.e.*, designed to come within the scope of standard tools—or if stock tools were immediately available. Unfortunately, neither is the case right now; many parts are so complex as to tax the ingenuity of the tool engineer, while the manufacturers of turret specialties are equally taxed to meet the demand for tools, both standard and special. And, the tides of war waiting for no man, may overwhelm the laggard. To meet the demands of emergency, then, we not only have to design tools that will net the greatest output with a deficit of machine tools, but, working with equipment which is not always suited to the job, may have to improvise.

As an example, one tool engineer was faced with a poser when, a while back, it was necessary to cut a 4-inch x 16 thread, to close tolerances, on a turret lathe not equipped with a lead screw. A collapsible die was used, but owing to the fine thread—*i.e.*, fine in relation to O.D.—and the drag of the turret carriage, the thread tended to strip. An ingenious foreman worked out a solution of a sort by gearing the turret feed to the pitch, but the nearest he could get was 16¼ turns in one-inch, or an over-run of 1/64-inch. This resulted in a progressive error of .001-inch per turn, which in turn meant a diminishing flattening of the root from the start of the cut on.

The final solution was comparatively simple once worked out, although it took some thought. Rather than go to the expense of installing a lead screw (for which the machine had not been designed) or a complete new train of gears, a simple differential was figured out that took advantage of the wear in the final drive—*i.e.*, between the turret feed rack and pinion. Choosing the nearest gear ratio which figured out to a slight minus in feed, this was offset by the raised pitch diameter of the worn pinion. This fed the turret carriage slightly in excess of that which would normally have been obtained with a perfect tooth form, but coincided almost exactly with the lead of the thread. Installed over the week end, it clicked on first trial and has been going nicely ever since.

Conventional layout

Before going farther into the unorthodox set-ups, however, an example or two of conventional layout may be in order. We'll "tool" the part shown in Figure 1, using simple tools and a conventional three jaw chuck. We'll show a turret plan, and cross slide tools, a favorite method with many designers, although "in line" layouts are simpler and easier

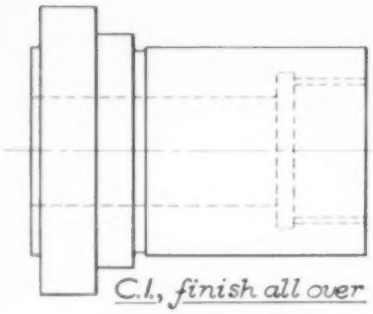
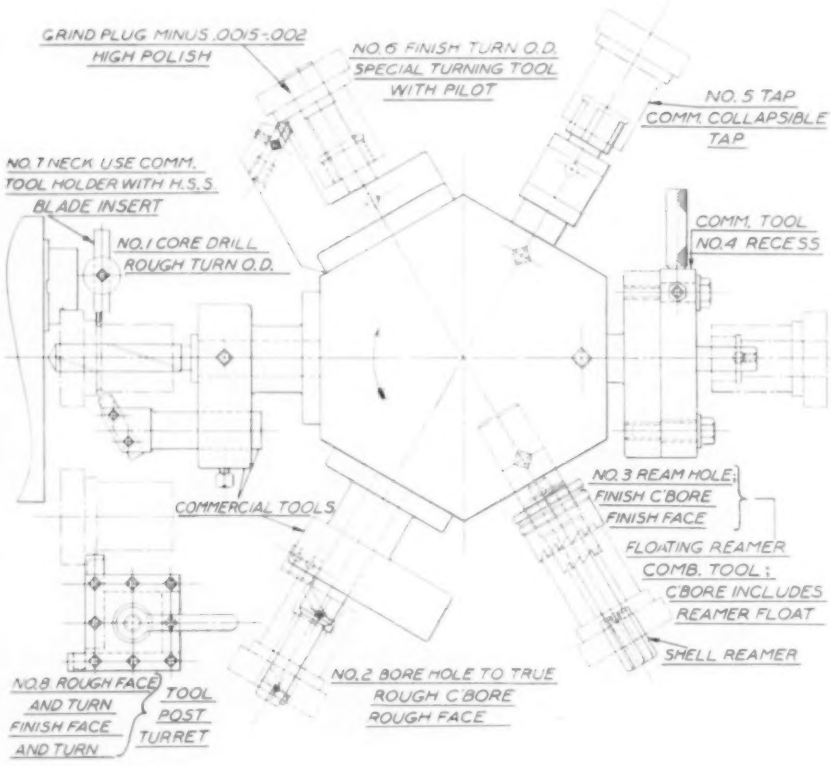


FIGURE 1
(Left)

FIGURE 2
(Below)
Elementary layout showing conventional tool set-up for machining parts shown on Figure 1. Tools shown are suggestive.



to draw since one uses mainly horizontal and vertical lines. For the benefit of the uninitiated or novice, be it explained that turrets turn clockwise, that, except in rare cases—as in older machines—each face or hole of the turret has its individual stop, and that all cuts must be confined to the actual turret travel exclusive of index stroke. This would seem obvious, but it's not so unusual to see expensive tools made up that won't clear the work when indexing. And tool designers have more chances than ever to pull boners, these days.

Cross slides are usually simple, in the plain machines, and clamped to the machine bed. Hand feed is by lever on the small machines, by screw and handwheel on the larger. Universal machines have carriage feed, crosswise and longitudinal, and some have crosswise turret travel as well. On plain machines, two tools are ordinarily used on the cross slide, the front for forming, the back for cut-off, although tools can be ganged. Universal machines are usually equipped with turrets on the cross slide, increasing their range, but commercial subturrets can be installed on practically any, or designed if none is available. This summarizes general description.

Referring now to Figure 2, we have the tool set-up to machine the part shown in Figure 1. The part is cast iron, finished all over, with the large face machined in a lathe as a final operation. The hole is cored. Disregarding chucking, the operation sequence follows: (1) core drill hole and rough turn O.D.; (2) bore hole to true up, rough c'bore and rough face end; (3) ream hole to size, finish c'bore and finish face end; (4) recess; (5) cut thread, using collapsible tap; (6) finish turn O.D., all from turret. With cross slide, rough and finish turn the stepped diameter, and neck. Simple as it is, the tool set-up shown must be accomplished with the compounding shown in sequences 1, 2 and 3.

Let us take one a little tougher, shown in Figure 3. This time we'll make the part of cast steel, with interrupted cuts to boot. And, we will machine it complete, as far as turning is concerned, on the turret lathe, but in two set-ups, flanged end first. Also we'll draw it up "in line", for the sake of variety, as in Figure 4. In this connection, note that the part is shown for each tool, as in the previous set-up. This is conventional practice and mentioned for the benefit of the novice. (Old timers, of course, know everything—sometimes). To reduce tooling costs, however—as on an indexing fixture—we will have the screw and dowel holes in the flange drilled and reamed as an intermediate operation. Since this operation is only incidental to the turret tooling, we'll not bother to describe it.

Machining operations

As in the previous job, we'll chuck the part (using air if you prefer), facing the end, boring the hole, reaming and counterboring, and boring the 10-inch diameter from the 2.440 c'bore. Incidentally, we'll use a ball bearing pilot, so as not to damage the c'bored hole. So far, simple tooling. Now, (after drilling the flange holes) we set the job up for the second pass, on a simple index fixture. We locate from the center hole, machining each of the three radial holes in turn, using the reamed dowel holes for index. The part can be clamped with simple strap or gooseneck clamps, the main object being to hold the flange true against the face plate which, by the way, must be counterbalanced. This can be done in commercial balancing ways.

To insure the close limits specified between holes, piloted tools are essential. Preferably, ball bearing pilot bushings should be used, since these entail the least wear on the bars and are themselves easily replaced should they be damaged. If plain bushings are used, it is well to use renewabies in a liner. And bronze is better than hardened and ground steel; they may not last as long, but they can be run with a closer fit without so much danger of seizing. All this may seem

incidental and elementary, but consider that once the machine is set up the main object is to keep it going with the fewest possible interruptions from breakdowns and wear. And that's about all for Figure 4, in which the tool set-up is self explanatory.

We'll add one note, however. Interrupted cuts are a headache, especially on some of this alloy steel which is coming through—and which may contain everything in the scrap pile category. But, if two or three tools are used in a holder or bar (THE TOOL ENGINEER, Nov. 1942, "*Boring and Boring Tools*," Figure 8) so that one or two are in the cut when one jumps the gap, and if negative rake (even to extremes) is used, and tools adequately supported top and side opposite to the cut, one gets surprising results. Even carbide tipped tools can be successfully used if set up as described.

Naturally, there are limits to the number of tools one can set up in a turret lathe, but within those limits one can effect a great variety of tool combinations, both from standard tools or special designs, or a combination of both. Such a combination is shown in the figurative layout, Figure 5. The illustration has no particular application outside of conveying ideas, and suggestion is all that is needed for the active mind.

One bugbear, on most turret jobs, is the boring and sizing of long holes to close tolerances. Still more of a headache is the combination of a long bore with a long O.D., when both must be closely concentric. The problem is considerably simplified when the cored hole and the O.D. of the rough casting is fairly uniform, an ideal condition that seldom occurs in actual practice. Besides, molders are in a hurry, these days, and one thankfully accepts such castings as one may get. The bore, however, can be quite accurately machined with piloted bars, which must be of largest possible diameter to reduce spring, and as accurately sized with reamers which, preferably, should be floating. Rigidly held reamers, especially if large (and consequently heavy) and piloted, tend to sag, in which case one or two of the bottom teeth tend to cut like a boring tool.

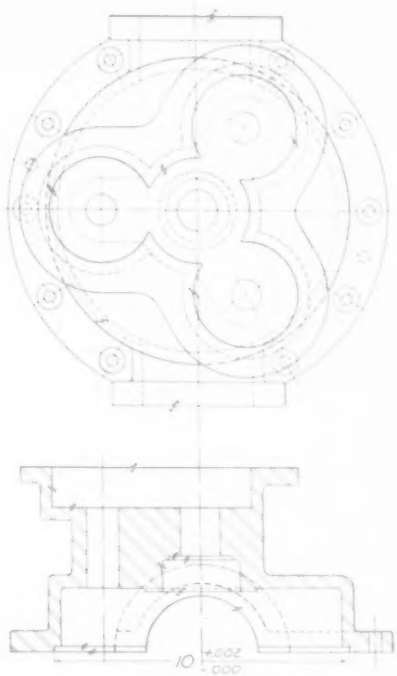
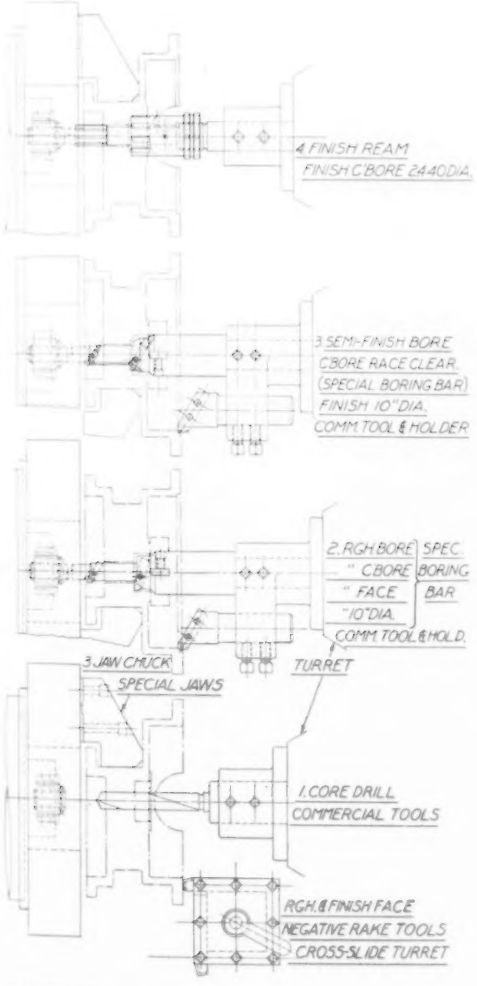
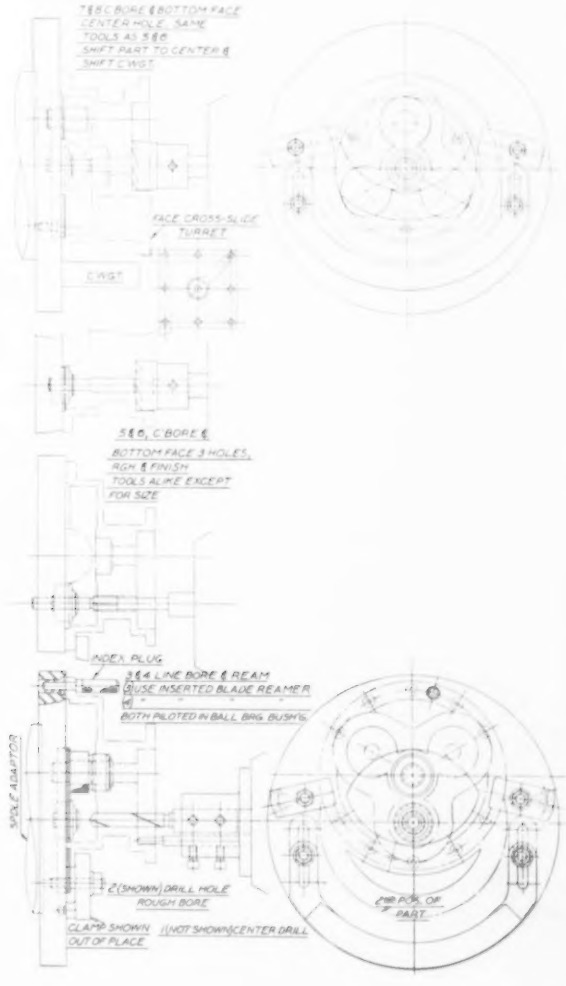


FIGURE 3.



(Left)
FIGURE 4-A

Simple tooling shown in "in line" layout


FACE CROSS-SLIDE TURRET
C'BORE & BOTTOM FACE 3 HOLES, RGH. & FINISH TOOLS ALIKE EXCEPT FOR SIZE
INDEX PLUG
3 & 4 LINE BORE & REAM USE INSERTED BLADE REAMER BOTH PILOTED IN BALL BRG. BUSH'G.
SPACE ADAPTOR
2 (SHOWN) DRILL HOLE ROUGH BORE
CLAMP SHOWN OUT OF PLACE
1 (NOT SHOWN) CENTER DRILL
END POS. OF PART

(Right)
FIGURE 4-B.

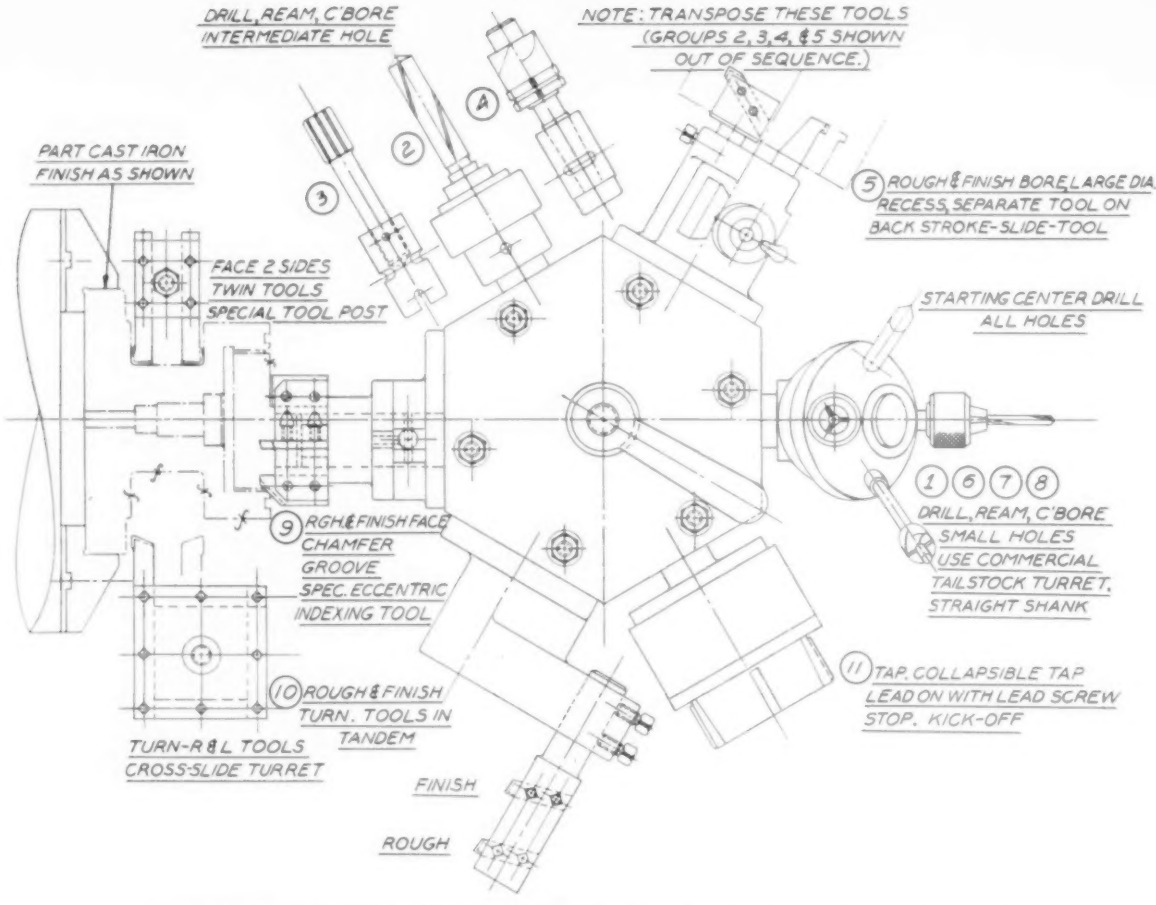

DRILL, REAM, C'BORE INTERMEDIATE HOLE
NOTE: TRANSPOSE THESE TOOLS (GROUPS 2, 3, 4, & 5 SHOWN OUT OF SEQUENCE.)
PART CAST IRON FINISH AS SHOWN
FACE 2 SIDES TWIN TOOLS SPECIAL TOOL POST
5 ROUGH & FINISH BORE, LARGE DIA. RECESS, SEPARATE TOOL ON BACK STROKE-SLIDE-TOOL
STARTING CENTER DRILL ALL HOLES
1 6 7 8 DRILL, REAM, C'BORE SMALL HOLES USE COMMERCIAL TAILSTOCK TURRET, STRAIGHT SHANK
9 RGH & FINISH FACE CHAMFER GROOVE SPEC. ECCENTRIC INDEXING TOOL
10 ROUGH & FINISH TURN. TOOLS IN TANDEM
11 TAP, COLLAPSIBLE TAP LEAD ON WITH LEAD SCREW STOP. KICK-OFF
TURN-R & L TOOLS CROSS-SLIDE TURRET
FINISH
ROUGH

FIGURE 5: This layout is designed merely to show tooling beyond normal range of turret and cross-slide. It is "educational" only, and can be adapted to much greater variety.

This condition is aggravated if the reamers are piloted.

However, if the production foreman *insists* on piloted reamers, a compromise is possible which permits straight holes. See that the turret hole is dead in line with spindle; if not, rebore turret holes or use an adaptor for exact alignment. But even this will not insure accuracy if the machine bed is worn, in which case the "climb" will result in a taper hole. That is, except in ram type machines. The better way, however, is to float the reamers, small ones at the shank (or grip) the large one at the body. The latter must float laterally, not endwise, or they may cock in the hole. A suggested float is shown in Figure 6, in which two springs, with adjustable tension, tend to neutralize weight and insure centrality in starting.

Where the I.D. and O.D. are machined in separate set-ups, it may be sufficient to rough bore, finishing with the reamer, but where both the I.D. and the O.D. are to be machined in the one chucking it is better to make an intermediate finishing cut before reaming.

This tends to correct any runout caused by badly out-of-round castings. The O.D. may then be turned in from two to three passes, using both a spindle pilot and an overhead pilot bar. For long life, use ball bearing pilot bushings. For extreme accuracy, a tool set-up as in Figure 7 will give dependable results. Note backing rollers (comparable to a lathe steady-rest) which should engage slightly behind the cutting tool. Note also the self-sizing but manually locked follower plug, which tends to maintain concentricity. This may be

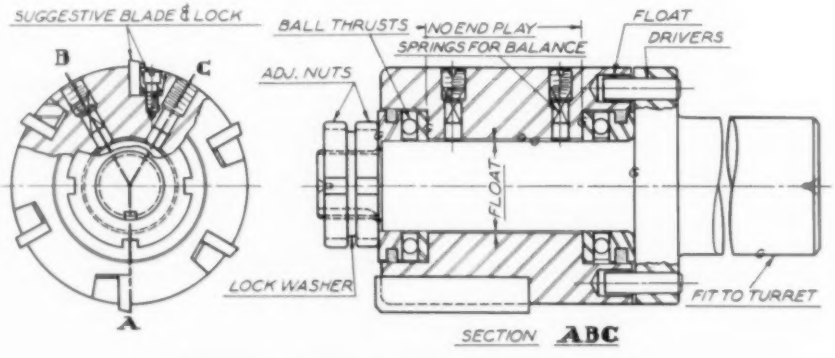


FIGURE 6. Suggestive float for heavy reamer.

(Right)
FIGURE 7

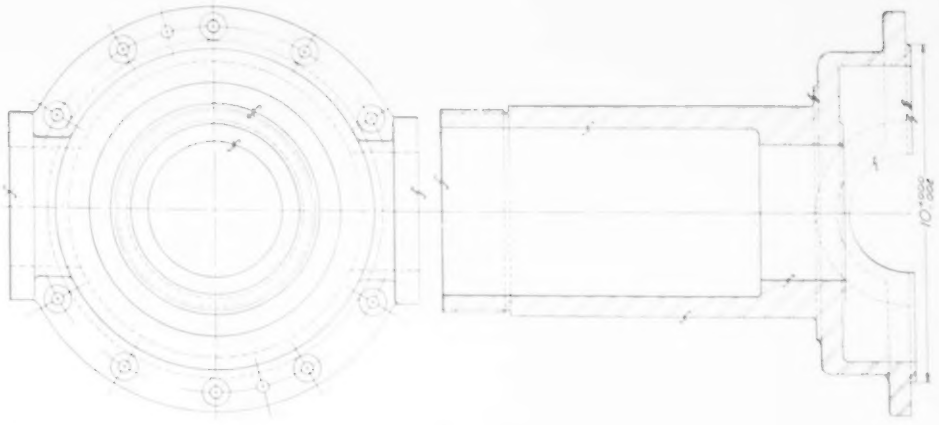
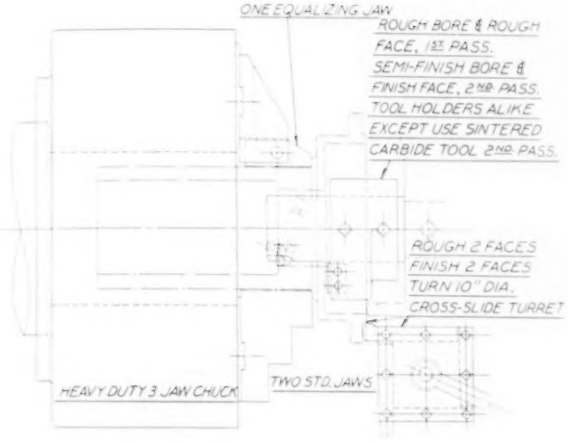
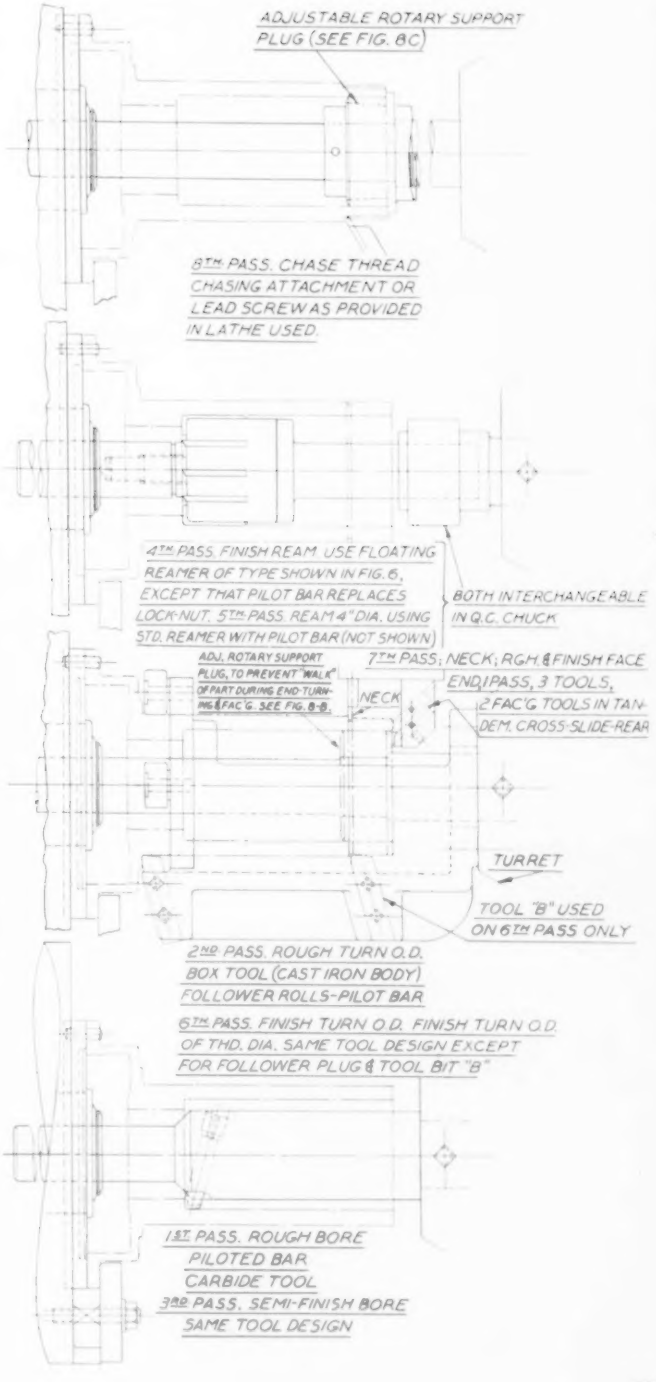


FIGURE 7-A
(Below)


ONE EQUALIZING JAW
ROUGH BORE & ROUGH FACE, 1ST. PASS.
SEMI-FINISH BORE & FINISH FACE, 2ND. PASS.
TOOL HOLDERS ALIKE EXCEPT USE SINTERED CARBIDE TOOL 2ND. PASS.
ROUGH 2 FACES
FINISH 2 FACES
TURN 10" DIA.
CROSS-SLIDE TURRET
HEAVY DUTY 3 JAW CHUCK
TWO STD. JAWS


ADJUSTABLE ROTARY SUPPORT PLUG (SEE FIG. 8C)
8TH. PASS. CHASE THREAD CHASING ATTACHMENT OR LEAD SCREW AS PROVIDED IN LATHE USED.
4TH. PASS. FINISH REAM. USE FLOATING REAMER OF TYPE SHOWN IN FIG. 6, EXCEPT THAT PILOT BAR REPLACES LOCK-NUT. 5TH. PASS. REAM 4" DIA. USING STD. REAMER WITH PILOT BAR (NOT SHOWN)
BOTH INTERCHANGEABLE IN Q.C. CHUCK
ADJ. ROTARY SUPPORT PLUG, TO PREVENT "WALK" OF PART DURING END-TURNING & FAC'G. SEE FIG. 8-B.
7TH. PASS; NECK; RGH. & FINISH FACE END, 1 PASS, 3 TOOLS, 2 FAC'G TOOLS IN TANDEM. CROSS-SLIDE-REAR
NECK
TURRET
TOOL "B" USED ON 6TH. PASS ONLY
2ND. PASS. ROUGH TURN O.D. BOX TOOL (CAST IRON BODY) FOLLOWER ROLLS-PILOT BAR
6TH. PASS. FINISH TURN O.D. FINISH TURN O.D. OF THD. DIA. SAME TOOL DESIGN EXCEPT FOR FOLLOWER PLUG & TOOL BIT "B"
1ST. PASS. ROUGH BORE PILOTED BAR CARBIDE TOOL
3RD. PASS. SEMI-FINISH BORE SAME TOOL DESIGN

variously designed, although the one shown in detail (Figure 8) will work nicely enough. Remember that, in facing the ends of long pieces, they tend to "walk"; this also can be overcome by means of an end pilot or guide plug.

So much for boring and turning, for the nonce, although one could expand the topic indefinitely. But in line with other operations, a few comments on threading may be in order. Given a lead screw, with change gears, one can cut either external or internal gears, the latter depending on accessibility and clearance. With a lead screw, one can "lead on" either taps or dies, (although a kick-off must be provided in the case of collapsibles) which permits roughing and finishing chasers to be used successively and without danger of crossing. In the opinion of the writer, the preferable lead screw employs a buttress thread of coarse pitch, geared down. However, the half or split nut is preferred by many. You'll use what you get, of course.

To get good threads with dies and taps, turret hole and spindle alignment is essential, else one is liable to get tapered threads. For that matter, alignment is essential to all turret

(Right)
FIGURE 7-B
The operation sequences as shown here are set up to insure maximum accuracy of bore and O. D. with one tool layout, one handling.

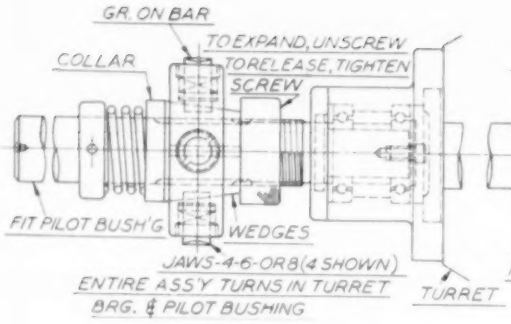


FIGURE 8-A

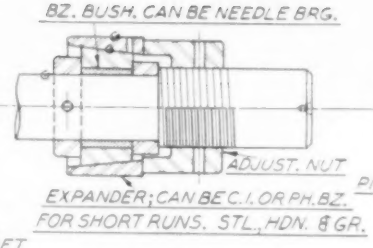


FIGURE 8-B
Plain expander plug.

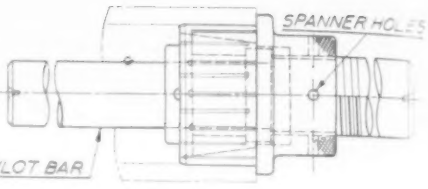


FIGURE 8-C
Same as 8-B, except for shoulder stop.

operations for accurate work, although the ingenious tool engineer can work wonders even with worn machines. One has to, at times.

For mass production, the single purpose machine stands in a class by itself, and while the turret lathe is flexible, its main function is the machining of turned and/or bored surfaces, as many as practical in one setting. Yet, the writer has worked out unconventional methods at various times (and seen more) which have increased the scope of the machines and, where it did not interfere with production schedules, saved later operations. For example, one can broach small shapes that do not strain the turret ram, catching the broaches in a tube in the spindle, or, one can press bushings into reamed holes, thereby machining and assembling in one set-up. In one case, a small multi-drill head, motor driven, was installed in the turret, permitting a complete job with one machine, one set-up, one operator.

There really is no end to ingenuity, the limiting factor being: does it pay? It's up to the tool engineer to decide that question. THE END.

MORE ABOUT WRIGHT TOOL STANDARDIZATION

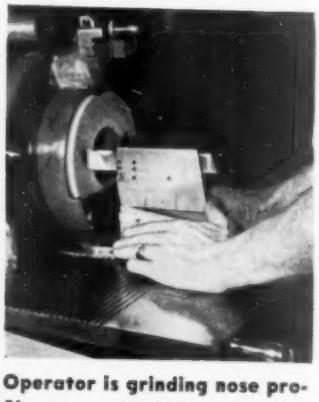
● INCREASING TOOL LIFE up to 2000 percent at a Wright Aeronautical plant (THE TOOL ENGINEER, October, 1942), resulted from carefully designed chip breakers, ultra-fine finish and standard rake, clearance and radius.

Angles for each tool classification are uniformly and exactly machine ground in gang fixtures holding as many as 18 cutting tools. This eliminates multiplicity of angles resulting from hand grinding by operators. Tools are finish ground and honed singly. Photos show gang fixture and templates and jigs used in achieving proper profile.

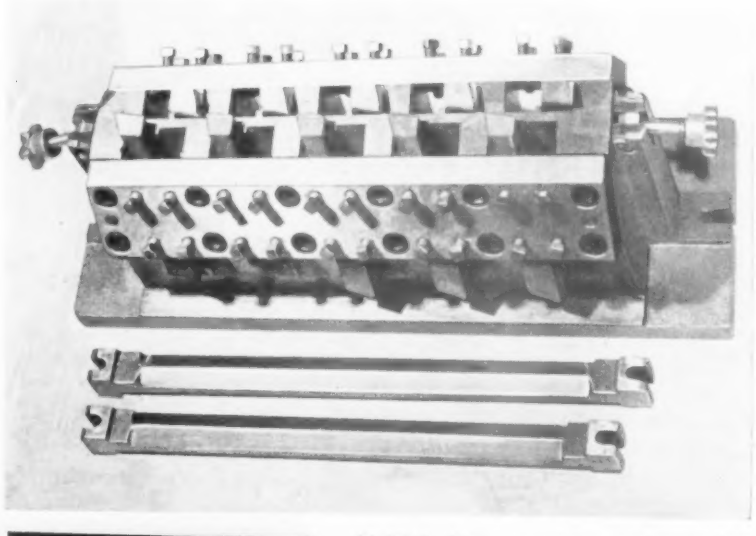
THE END.

After adjusting tool in template, using stop on side of machine, operator holds template against guide fastened to Oliver grinder to control tool shape. Operation is performed wet.

Wright Aeronautical Photos



Operator is grinding nose profile on a cutting tool using Bura-Way grinder. Operation is performed dry.



Multiple fixture used for surface grinding various angles on cutting tools under new system of tool standardization instituted by Wright Aeronautical Corporation.

Timing is as important in a machine gun as in an internal combustion engine. Colt inspection equipment assures precision of parts controlling such factors. It is also designed to be simple and foolproof, thus permitting efficient use by unskilled inspectors

INSPECTION AT COLT

CARLTON G. NELSON

QUALITY ENGINEER
COLT'S PATENT FIRE ARMS
MANUFACTURING COMPANY

THE SYSTEM OF INSPECTION which we use in modern manufacture probably started about 1847, when Eli Whitney was given an order by the U. S. Army for 10,000 muskets. In those days of cut-and-try, 10,000 muskets was quite an assignment. The ingenious Whitney simplified his task by standardizing his various pieces through the use of gages. Colonel Samuel Colt, in 1855, was one of the first to adopt this new method in the manufacture of his revolvers, and from that was laid down the foundation of the methods used today in gaging and inspection.

In all factories, no matter how well equipped, there is still one factor which cannot be predicted. This is the human element. The invention of the gage has done much to standardize even this, nevertheless, inspection departments must train their inspectors in the intelligent use of their gages, and this, in turn, calls for devising gages which will be foolproof and easy to understand. Especially is this true in these times when women and elderly men, who have had to readjust themselves, must be put to work in place of those who might be more mechanically inclined. Not that this is uncomplimentary to the women, since they can be taught how to read micrometers just as quickly as the men, and in many cases have more patience and endurance than the men.

COLT INSPECTORS

WITH THE RISE in production at Colt's the inspection staff has increased since January 1, 1941, more than 500 per cent. Most Colt inspectors have averaged only six to seven months' service to the company, because of the rapid turnover due to the draft. Our methods must be foolproof, since little time can be spent in training.

In the main plant of Colt's Patent Fire Arms, which has always made the famous Colt Revolver, attention is now confined to the .38 revolver, the .45 automatic pistol, and the caliber .30 and .50 machine guns.

The caliber .30 water-cooled gun contains 189 pieces. It is usually mounted on a tripod and fires 5-600 shots per minute. This is but one of the several types which Colt makes. This gun is a consistent performer. The original fired 48,000 rounds without a breakage.

Another type is the caliber .30 aircraft gun, aircooled, and used in airplanes as either a flexible or fixed gun. These guns will contain up to 250 pieces. They fire at a rate of 1400 rounds per minute.

Also in the caliber .30 class is the Browning automatic rifle, used as either a semi-automatic or a light machine gun. In the caliber .50 or heavy class, is the water-cooled, tripod mounted machine gun. Its equivalent for use in aircraft is an air-cooled gun, capable of firing 900 rounds per minute.

Needless to say, the production of all the parts for these

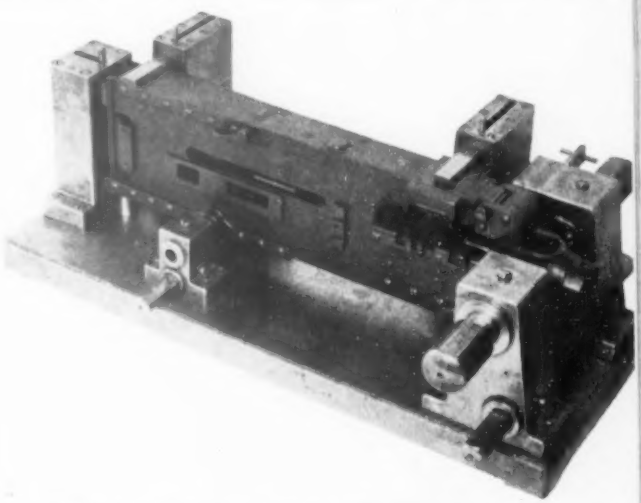


FIGURE 1. When mounting machine guns in airplanes, it is important to consider that the gun-mounts are welded in place. If all mounts are correct, we must have all guns standardized for quick replacement. A 12-point gage, shown above, checks this, along with alignment and overall dimensions, also checking the position of the feedway—which must be held to close limits—relative to the mount.

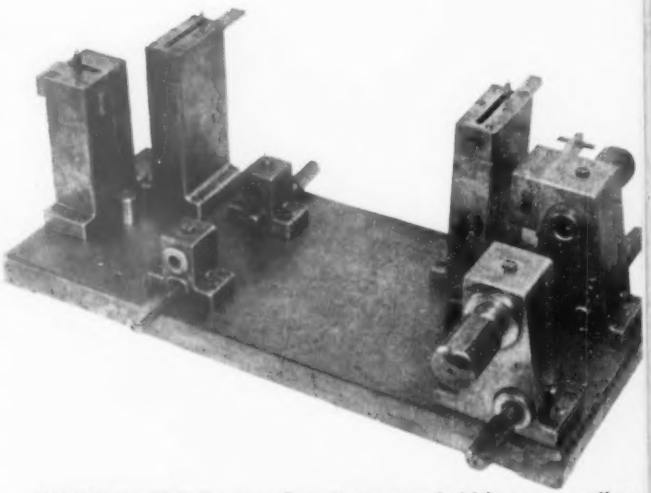
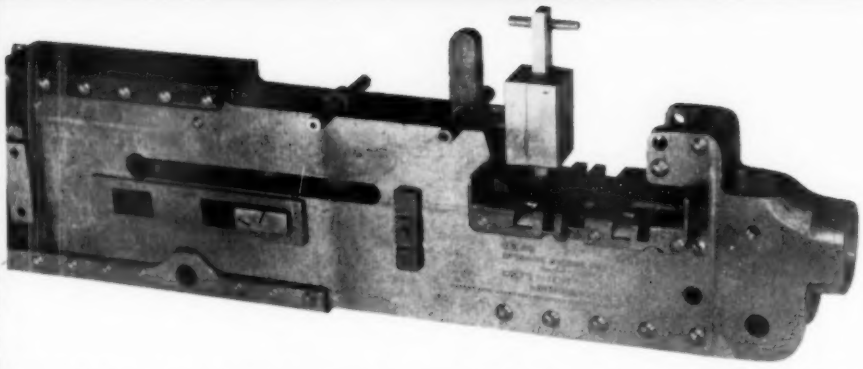


FIGURE 1a. This jig uses flat plug gages held in proper alignment by the body of the gage. It represents the combination of two or three gages.



URE 2. Before the gun is fired, it must be timed. Timing is as important in a machine gun in an internal combustion engine. To guarantee timing within prescribed limits, the ition of the trigger must be gaged in the case before assembly. In the fixed aircraft , the trigger is an electrically-controlled unit, clamped onto the gun, and operating n either side. Gage shown checks position of side-plate trigger slot relative to the nion block. The step in the sliding plug allows .010-inch limits.

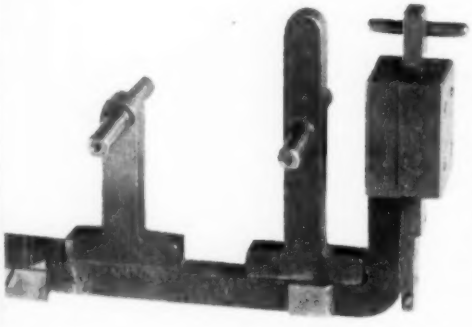
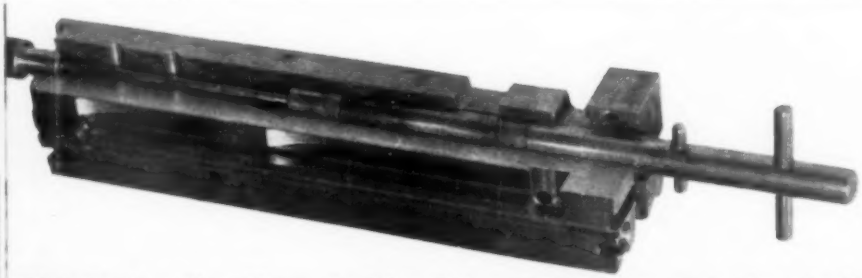


FIGURE 2a. The gage itself is a simple affair, and calls for only average intelligence in its use. Being symmetrical, it can be used for checking either side of the guncase, since the gun fires from either side. There are two locating surfaces in the rear, and a sliding flat-plug which indicates Go and No-go. A pad at the side ensures parallelism with axis of the gun.

guns keeps an inspection crew busy 24 hours a day, every day in the week. Slowing down of production due to inspection depends upon the complexity of the parts. Screws, pins, studs, and rivets can be given a fractional inspection—say 10 per cent, unless trouble arises which makes more careful inspection necessary. Practically all other parts require 100 per cent inspection at different operations along the line. For this, an inspector is stationed at the machine to pass the work as it is produced. To keep the man busy, however, he is usually given several jobs to do at similar machines.

With only a few exceptions, all of the larger pieces are made from forgings, which are given 100 per cent inspection for surface defects, form, and general perfection.



URE 3. On the caliber .50 gun, the firing pin is composed of two parts, the extension a striker. Both parts must slide freely in the bolt, through which there is a shouldered e. A gage anticipates this condition in the bolt.

URE 3a. A bushing, which fits over one end of the gage, provides a means of checking alignment of a hole in the face of the bolt, which takes a hardened insert called the oil plate. This simple gage then indicates the alignment of no less than three holes. It can be used to good advantage, quickly, and with no great skill involved.

When the forgings have passed inspection, they are moved to heat-treat, where they are either annealed or toughened to the correct degree before machining. Since parts are usually done in batches, usually only a fractional inspection is given for the correct Brinell or Rockwell.

All parts now having been heat-treated, they are moved to the Blanchard grinders, where 100 per cent inspection is conducted. Considering the caliber .30 machine-gun bolt as a typical example, after preliminary grinding of the bar-stock, about 135 operations go into this bolt before it is finished. For machining alone, more than 100 gages must be applied to it, some operations requiring 100 per cent inspection, again at the machines. All this goes on before the bolt is filed, heat-treated, the holes lapped, and the ways ground, these operations requiring the use of about 40 more gages. When the bolt has been finish-machined, final inspection takes over with about 32 gages, which sum up all the key-points.

BREECH CASE

THE BREECH CASE is the backbone of the gun, and is composed of left and right hand sideplates, a top plate, a bottom plate, and a trunnion block. The only part of the case which is heat-treated is the back part which holds the backplate. This piece stands for a lot of abuse, taking a force of about 6000 pounds with each shot, due to the force of recoil. At the rate of several hundred rounds per minute, it takes a beating and therefore must be carefully inspected. Fortunately, the tubular part of the backplate contains red fibre discs which deaden the blow, nevertheless the back plate calls for close attention. Also included in the picture are the accelerator, the bolt feed lever, and the barrel extension, with their respective forgings.

The question arises as to how these complicated shapes are gaged. Guns differ from other mechanisms, in that instead of taking measurements from a base line, the dimensions that are usually checked start from a reference point selected by experience. The breech case, for example, must be checked for both alignment and timing.

When mounting machine-guns in airplanes, it is highly important to consider that the gun-mounts are welded in place. This means that if

all mounts are correct, all guns must be standardized for quick replacement. A 12-point gage checks this, along with alignment and overall dimensions, also checking the position of the feedway—which must be held to a close tolerance—relative to the mount. (Figure 1).

GAGING TRIGGER POSITION

TIMING is as important in a machine gun as in an internal combustion engine. To guarantee that it will be within prescibed limits, the position of the trigger must be gaged in the case before assembly. In the fixed aircraft gun, the trigger is an electrically-controlled unit, clamped onto the gun, and operating from either side. The gage checks the position of the sideplate-trigger slot relative to the trunnion block. The step in the sliding plug allows .010 tolerance. (Figure 2).

The gage itself is a simple affair, and calls for only average intelligence in its use. Being symmetrical, it can be used for checking either side of the gun-case, since the gun fires from either side. There are two locating-surfaces in the rear, and a sliding flat-plug which indicates go and no-go. A pad at the side ensures parallelism with the axis of the gun. (Figure 2a).

There are special cases of inspection which call for close observation but volume output, also the use of something more than the usual plug or snap-gage. Alignment of the firing-pin in the bolt is one of these. Perfect alignment is necessary, otherwise a firing pin falling at the rate of a mere 900 times a minute would soon break.

FIRING PIN MECHANISM

ON the caliber .50 gun, the firing pin is composed of two parts, the extension and the striker. Both parts must slide freely in the bolt, thru which there is a shouldered hole. A gage anticipates this condition in the bolt. (Figure 3). A bushing provides the means of checking the alignment of a hole in the face of the bolt, which takes a hardened insert called the recoil plate. This simple gage then indicates the alignment of no less than three holes, yet it can be used to good advantage, quickly and with no great skill involved.

In order to ensure that firing-pins will strike the center of the primer, alignment must be checked between the boltways and the recoil plate.

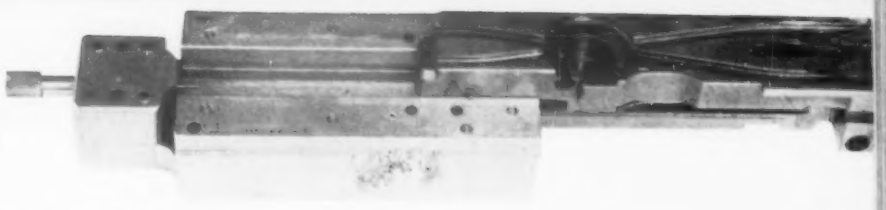


FIGURE 4. In order to ensure that firing-pins will strike the center of the primer, alignment must be checked between the boltways and the recoil plate. If it were not for the simple receiver gage in use, this job would be one for a toolmaker.

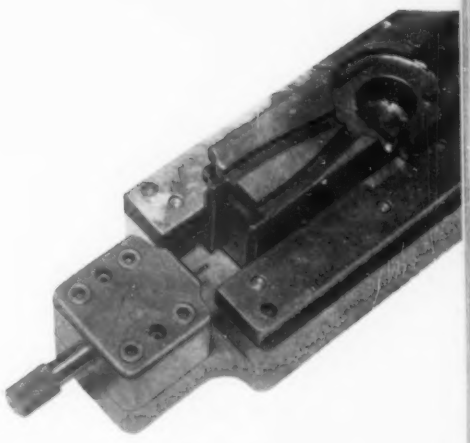


FIGURE 4a. This gage holds the bolt in position to be checked by the pin.

(Figure 4). If it were not for the simple receiver-gage used, this job would be one for a toolmaker. The gage holds the bolt in position to be checked by the pin. (Figure 4 a).

Five barrels are turned out for every gun produced. Inspection must be quick but correct. Among other requirements, the barrel must be perfectly straight, and in order not to depend only upon the eyes of the experts who do the straightening, a drop-plug is used after both reaming and rifling. This plug is a solid steel cylinder eight inches long for the caliber .30 and 12 inches long for the caliber .50. In either case, this plug must drop freely thru the barrel, yet it fits with a maximum clearance of one and seven-tenths, and a minimum of two-tenths.

Another point in the barrel, which must be carefully watched, is the chamber. The surface of the chamber must be perfectly smooth so that the high pressure of the burning powder, which amounts to 28 tons to the square inch, will not force any of the brass into grooves or tool-marks. If this were to happen, extraction of the empty case would be impossible, and the gun would cease firing. For this reason, visual inspection is employed on the inside of the chamber. (Figure 5). Since the hole is small, and dark inside, a small reflector is placed at right angles to the bore in such a way that the inside is illuminated, thereby allowing flaws to be detected. Unfortunately, this reflector will not bend light around corners, with the result that the neck of the chamber remains dark. (Figure 5a). For this, a boroscope is used.

FIGURE 5. Visual inspection is necessary to detect flaws in the chamber of the gun. Under tremendous pressure of exploding powder, empty cartridge case would be forced into scratches or fissures in chamber wall, and extraction would be impossible.

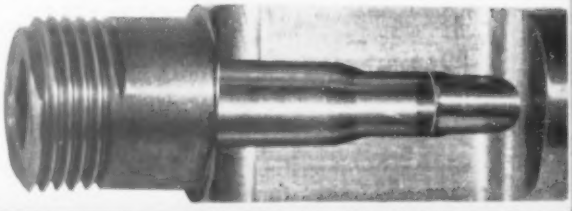


FIGURE 5a. Though a reflector is used to illuminate the chamber's inside, the neck of the chamber is still dark (as shown in the cutaway). A boroscope serves to light this section.

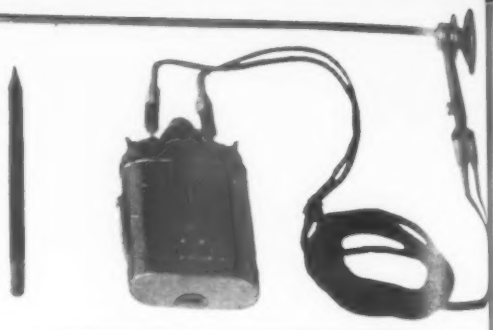


FIGURE 6. The boroscope is used by the barrel inspector for detecting flaws midway in the barrel. This instrument is shown in comparison with a lead pencil. It contains its own light-source and a system of reflectors which convey an image of the bore surface to the eye-piece which is equipped with a magnifying glass.

FIGURE 6a.
(Left)
This shows the light-source of the boroscope.

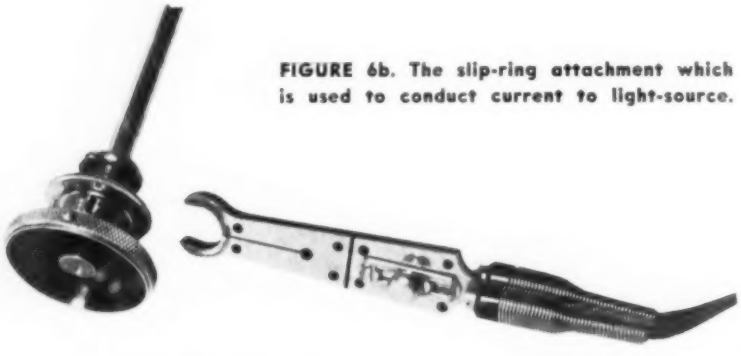


FIGURE 6b. The slip-ring attachment which is used to conduct current to light-source.

THE BOROSCOPE

THE BOROSCOPE is used to find flaws midway down the barrel. Thick as a lead pencil, it contains its own light-source (Figure 6a), and a system of reflectors which convey an image of the bore-surface to an eye-piece containing a magnifying glass. A slip-ring attachment conducts current to the light source. (Figure 6b).

With the focal-length of the eye-piece, about 20 inches, the view of one of the grooves in a caliber .50 barrel reminds one of driving down a highway. Another key-point which challenges the skill of the gagemakers is in the sear of the gun; still another is in the firing pin.

When the firing-pin is cocked, there must be some means of holding it safely in that position until ready for firing. The sear does this. In order that both sear and firing-pin shall hold correctly, their mating surfaces, shaped like hooks, must be undercut to prevent slipping. If this were not so, uncontrolled fire would result, and the gun would run wild until the ammunition was exhausted.

To check this undercut, it is easier to use a shadowgraph than a steel gage of any kind. Not only does this reduce errors in judgment, but it permits volume handling which would be slowed down by the use of a standard gage.

The shadowgraph also pays for itself in checking firing-pin strikers. The striker must be smooth and ball-shaped in order not to puncture the primer. In the event that a rough striker found its way into a gun, the primer might rupture, and the resulting blow-back of gas could injure the operator. Fortunately, the shadowgraph will magnify any irregularity in the shape of the striker. It will also show whether the striker is bent as it is rotated in its support in the machine, thus accomplishing two purposes, which would not only take time, but would require skill in detection.

•

From this discussion of simplified gaging, it might be assumed that the Colt company is attempting to do away with skilled labor. Not at all. One of the choice jobs for skilled workmen requires working to zero tolerance. Fitting barrels to revolvers requires exactly that.

The front sight is brazed to the barrel before finishing. This means that the workman must qualify his threads in order to bring the sight up to correct position. One thousandth off at 15 yards would cause an inaccuracy in shooting of seven-eighths of an inch. All Colt guns are fired and targeted before passing final inspection, and an error of this size is simply not tolerated.

THE END.

ARMY ORDNANCE DEVELOPS GLASS PRECISION GAGES

LARGE-SCALE SUBSTITUTION of glass for steel in the manufacture of precision gages will be possible soon as the result of experiments by the War Department. According to Thornton Lewis, Deputy Chief of the Production Service Branch of the Army's Ordnance Department, up to 50 per cent of the hundreds of thousands of steel gages used by manufacturers and inspectors of Ordnance items may be replaced by glass.

Although only a few glass gages have been placed in service, indications are that they will prove more efficient than steel in several respects. Numerous greasings and degreasings are eliminated since no question of rust is involved. Further, scratches on glass do not raise a burr or change the effective size of the gage. Glass is lighter and easier to handle, and in some cases visibility of inspection is increased.

Because thermal conductivity of glass is less than steel, heat from the inspector's hands will not affect gaging dimensions. Perspiration has no corrosive effect. Most important at this time, however, is the saving of tool steels. Also worth while is the lowered cost. After molds are made, the cost of glass gages is about half that of steel.

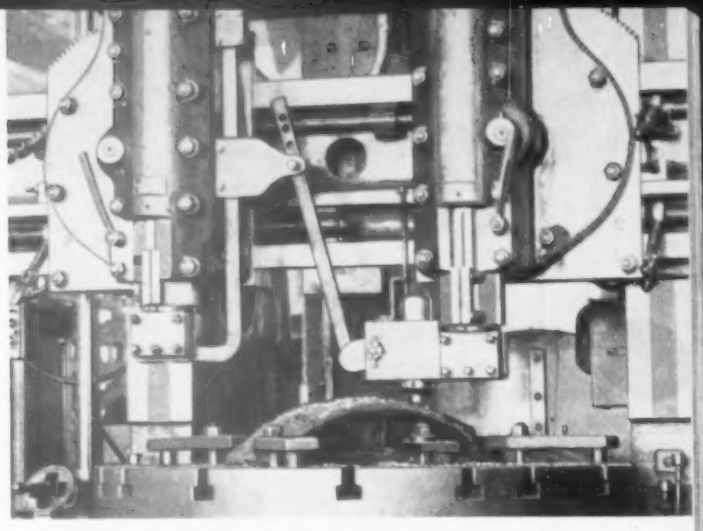
Conversion of gages to less critical material is one of many examples of meeting the competition of global warfare by constantly going over designs and seeking improvements.

Spherical Turning on the BORING MILL

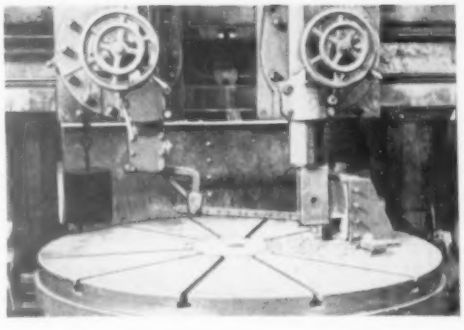
● Most Tool Engineers are familiar with various and ingenious spherical turning attachments, especially those used on turret lathes for such production work as on pipe ball handles. Another device, which is novel and offers several interesting features, is shown in use on a boring mill. (Figure 1).

A sliding head is incorporated in the attachment to hold the tool and the direction of the vertical movement imparted to the tool by the radius rod is reversed by a short rocker arm. A coil spring is used to take up the slack in the linkage and presses on a bracket above the tool block. This device is satisfactory for light cuts and little labor is required to fit it on the machine. (See details in Figure 2).

A simple attachment for concave turning is illustrated in Figure 3. It consists of a tool holder with a sliding block and means to attach a radius rod. The End.

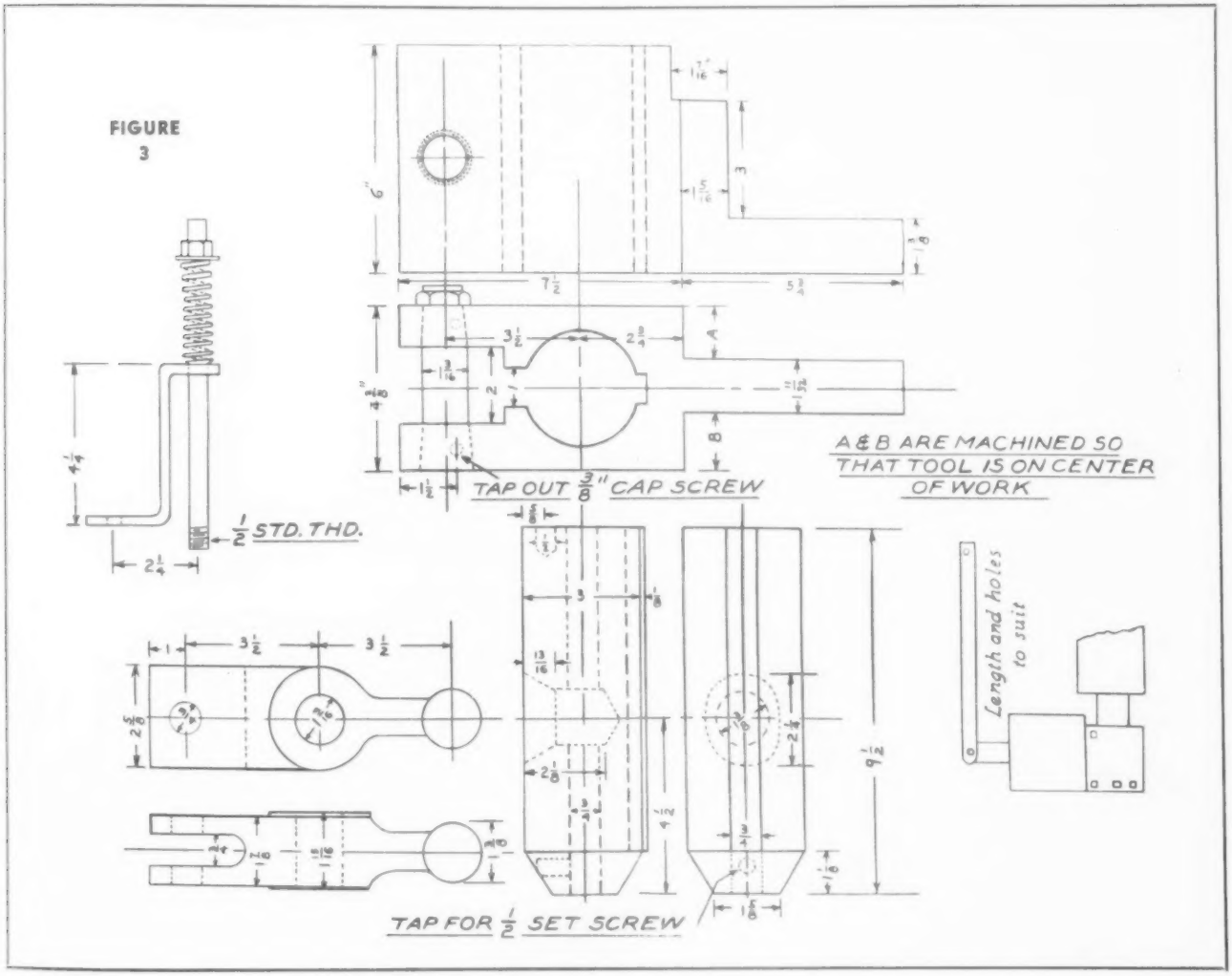


Above: FIGURE 1



Right: FIGURE 2

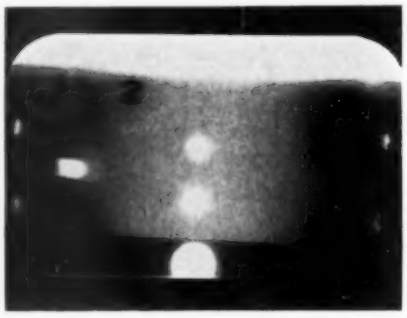
FIGURE 3



X-Ray Inspects Weld

R. I. HANFORD
ILG ELECTRIC
VENTILATING COMPANY

FRAMES for direct current motors are produced from a steel billet rolled into a ring and butt-welded. To make sure that a homogeneous weld is made, and that no sag, oxide or flux is included, an X-Ray radiograph test is made. Four pictures are taken of



the frames, each embodying one-fourth of the circumference. Externally, the weld is so good that it is not discernible after finish machining. Quarter shots insure inspection of the weld.

Material of lesser density appears on the X-Ray negative as a dark spot or line, and greater densities show light. Customary X-Ray inspection requires no more than a negative. The photo shown here is a positive print and indications are reversed. Light circular spots indicate pole piece holding screw holes and the darker part at the bottom indicates a thick section.

X-Ray tests showed both weld and steel free from defects. The steel test was important. In the transition of direct current motor design, frames were first cast from pig iron which soon gave way to good quality grey iron. Then a mild steel casting was used because it could be worked at a higher density for a given number of ampere turns. Its disadvantages were the presence of blow and shrink holes and the presence of hard spots which slow machining and also tend to create unbalanced distribution of flux passage to the field poles.

Rolled steel replaced cast steel because no blow or shrink holes and few hard spots were encountered.

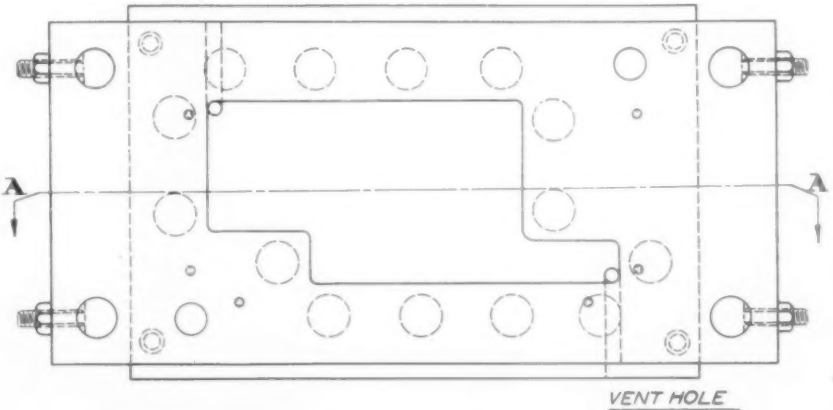
THE END.

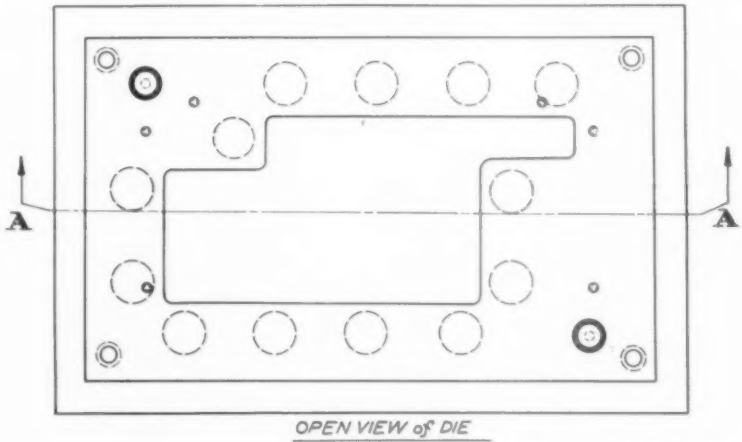
Two Parts Formed with One Die, One Press

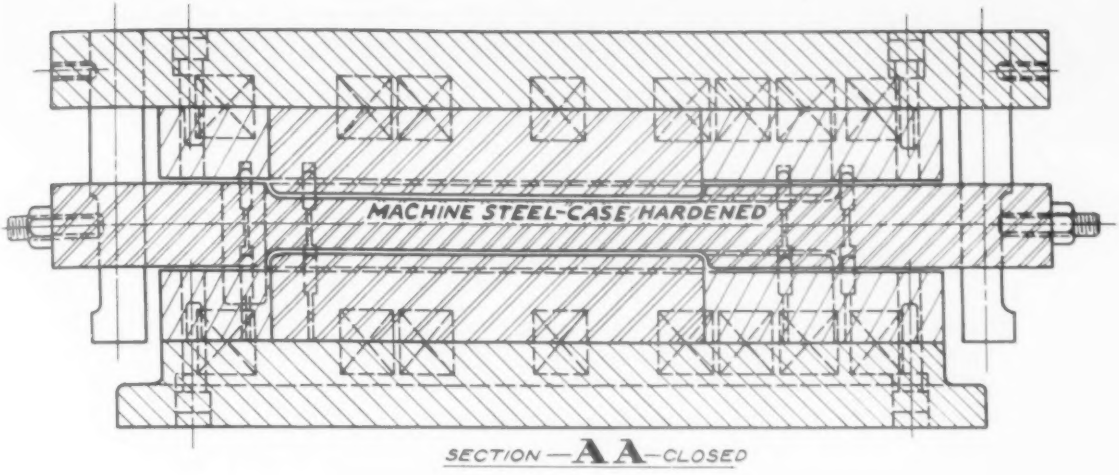
Designed by
ADOLPH MELETTI

THE DIE SHOWN in the accompanying drawings offers unusual conservation of materials, manpower and machinery. Design permits shallow drawing of right and left cover plates (or similar pressed steel parts), requiring only one tool and one operation. It eliminates the use of two dies side by side in a single press, a pair on separate presses, or changing over to produce lefts and rights in separate operations.

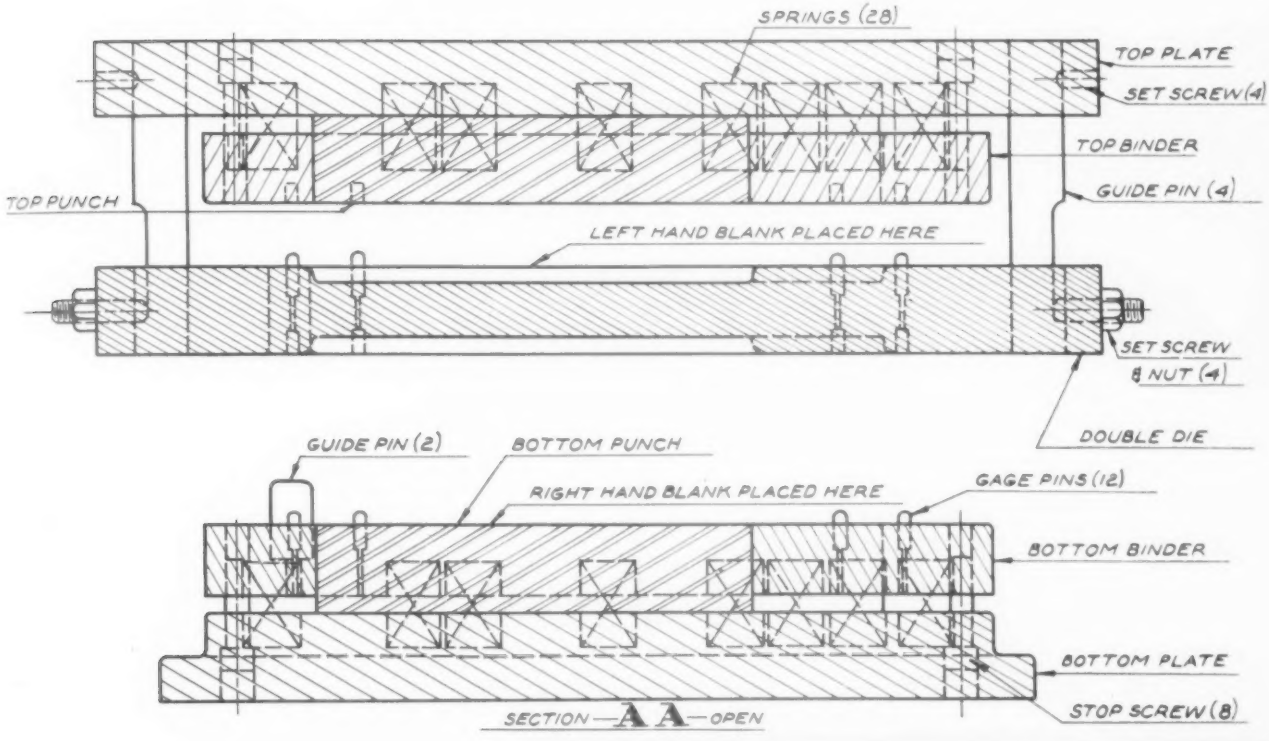
According to the designer, it is not necessary to produce duplicate parts, as long as the shapes are fairly similar and the draws of a reasonable depth. Hence, there is wide application. Actually, the design embodies two dies in one, one over the other. However, only one die set is required, with considerable saving of material. A further saving is implied in the use of one press and the employment of one operator.



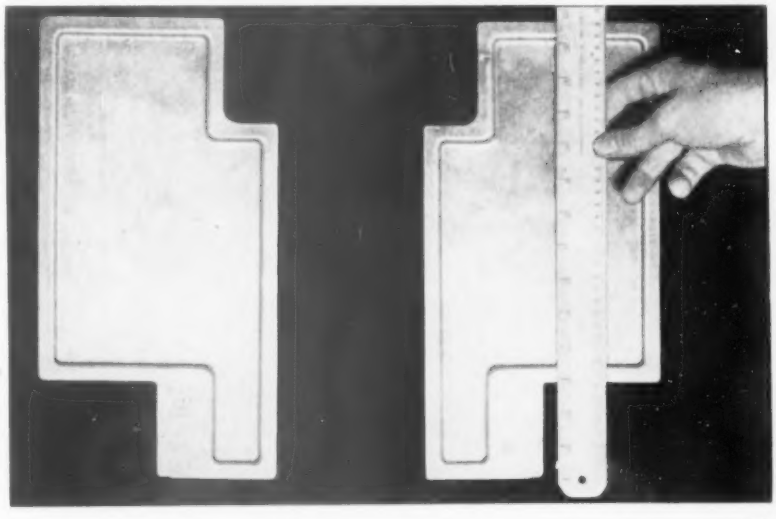




SECTION — A A — CLOSED



SECTION — A A — OPEN



Right and left hand cover plates for aircraft radio sets are being produced with a single die, in a single press. This type of stamping, fairly common in aircraft and other war production, is ideally suited to application of the method described by the drawings on this and the facing page. It is not, of course, necessary to produce duplicate parts, though they must be fairly alike in size. The number of parts that may be produced is regulated only by the shut height of the press.

THE END.

Template Production for Aircraft Tooling

R. R. NOLAN

SUPERINTENDENT OF PRODUCT ENGINEERING
NORTHROP AIRCRAFT, INC.

• The development of electrolytic etching in aircraft tooling, typifies methods used to solve problems peculiar to the aircraft production engineer. Until recently, few other industries could offer trained personnel or equipment to help him. He has overcome difficulties by designing machines and developing methods entirely new, by dusting off certain types of antiquated equipment, by reviving long-forgotten or little-used techniques, and by borrowing boldly from completely unrelated industries.

Etching falls into this latter category. Used by German and Italian artists early in the fourteenth century, it is employed commercially today for signs, name plates and photo-engraving. Though it is used in aircraft for the production of some of these parts, a new development completely overshadows such obvious employment of the technique.

ELECTROLYTIC ETCHING has been developed at the Northrop Aircraft Plant for manufacturing templates and their related functions, a method entirely new to the production of accurate aircraft tools, so far as is known.

With all the large-scale dramatic problems facing the tool engineer, the problem of template duplication may seem minor. Yet, approximately five thousand templates are required to produce the average single-engine all-metal airplane, and the majority of all tools necessary to build the airplane have their origin in templates. Tremendous production schedules and factories all over the country building the same airplane, necessitated some new means of producing accurate full-scale reproductions of layout and tooling templates.

Template reproduction has always been a laborious man-hour consuming task, requiring high skill to copy the master templates with consistent accuracy, line for line by scale and divider. Special machines were used to cut the contours of the duplicate templates, using the master as a pattern. The job required men badly needed for original template layout.

To overcome these problems a method was developed to secure direct full-scale photographic images on sensitized metal. This process is theoretically sound but, while eliminating many former difficulties, it contains certain objectionable features. Lenses of sufficient focal length to cover large surfaces and maintain sharpness of line are difficult to grind without distortion and are costly. Then, too, the resulting photographic images laminated on metal lacked durability, and the necessity for tool durability today needs no elaboration. Variations in template stock thickness, and the necessity of keeping copy and lens boards in absolute parallel to the sensitized metal, have presented extremely difficult problems.

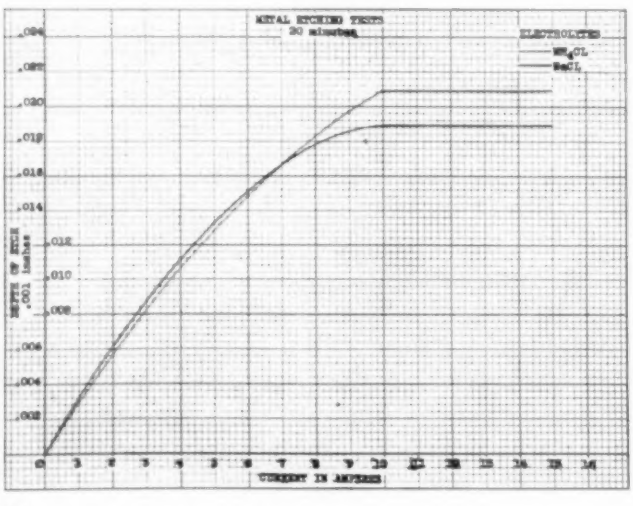
Another template duplicating process using X-rays was instituted. This is a direct contact method but it too retains many of the objectionable features found in the camera procedure. The X-ray process as used in one plant and as most photographic systems are now used, required a radical revision of engineering and loft techniques and produced the same lack of durable image.

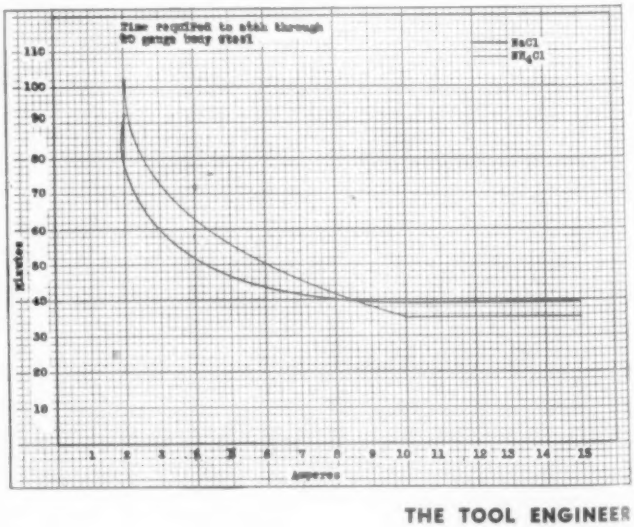
In both X-ray and photographic duplication, contours had to be cut by hand or mechanical means. In both cases the cost of equipment and supplies was by no means economical.

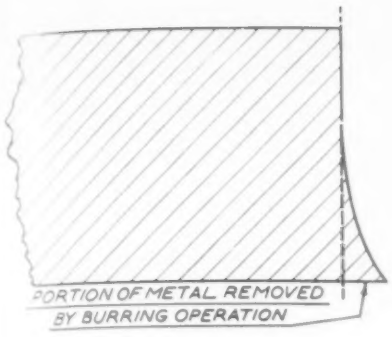
•

IN SUMMING UP the disadvantages and objectionable features of the photographic and X-ray methods it appeared that the ideal template duplicating process should possess the following features:

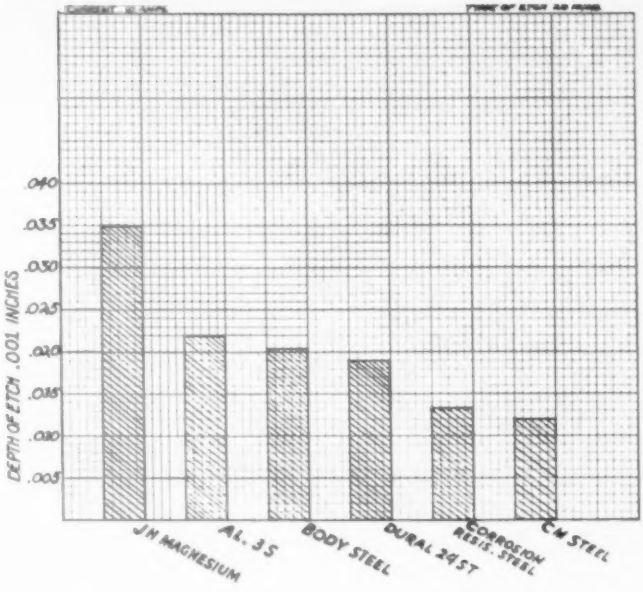
1. It should produce exact scale reproduction; no distortions or widened lines due to optical or contact error.







Left: **Cross-section of metal showing etched fillet. Only a small amount of burring is necessary to produce a finished template.**



Right: **This chart is a 20-minute, 10-amp test on various materials. Note magnesium.**

2. It should be extremely durable; more durable if possible than the scribed original.
3. It should produce a complete template and eliminate costly cutting operations.
4. It should be a process that could be accomplished by semi-skilled labor.
5. It should be a process cheaper to install and maintain than expensive camera equipment.
6. It should produce templates at a much lower cost per square foot than previous methods.

Through the efforts of Mr. Gibian, supervisor of loft and template at the Northrop Company, and his laboratory chief, Mr. Chatten, Northrop has adapted electrolytic etching to template duplication, perfecting a process which fulfills all of the requirements mentioned.

Step-by-step procedure

IN PRACTICALLY ALL duplicating processes, the first step is to obtain a negative, unless the original layout is made of transparent material. In photography, it is obviously a photographic negative. The X-ray process employs an opaque mirror image. Etching involves the use of a transparent negative which is secured by contact printing.

The template or group of templates to be duplicated are placed on the bed of a specially designed press which resembles in principle the cylinder printing press. It consists of a heavy horizontal bed upon which is mounted a heavy steel roller which is made to travel mechanically back and forth across the face of the bed. The roller is spring loaded against the bed of the machine to compensate for slight variations in metal thickness. The press can be any size depending upon the size stock used. Four feet by six feet is a convenient handling size.

The face of the template is inked by a composition roller. A special ink has been formulated for this purpose by a leading manufacturer of printing inks. It has excellent laying qualities and maximum opacity. A sheet of thin grained acetate is placed over the template and a total pressure of approximately one thousand pounds is applied by passing the steel roller over it.

Because the ink does not fill the scribe lines or stamp depressions on the template, these areas are clear on the resulting impression on the acetate sheet. It is dusted with finely ground lamp black in order to insure instantaneous drying of the ink image and to increase opacity. This is the negative.

Duplicate templates are made from auto body steel, which must be rendered chemically clean before any work can begin. It is put through an ordinary degreasing process, using any type of greaseless solvent such as carbon-tetrachloride of phenoid. The steel is then scrubbed with a stiff bristle brush and powdered pumice, an operation which may be done mechanically or by hand, depending upon the volume of work. All traces of pumice are thoroughly flushed away with cold tap water. The sheet is now ready for application of the sensitizing agent.

The sensitizer may be any colloid such as photo-process glue, gum arabic or resin combined with ammonium bicromate which has the property of hardening under light exposure. By trial and research Northrop engineers have developed a sensitizing medium which gives excellent results and keeps indefinitely in a liquid state.

Several advantages

THIS TEMPLATE PROCESS has been kept within the limitations of commercially available chemicals and supplies, from the standpoint of both availability and economy. The sensitizer is economical, about four ounces being required to cover a four by six sheet at slightly more than three cents an ounce.

While still wet from its water rinse, the sheet is placed in a whirler, a rotating table enclosed by a circular case with a removable cover. The sensitizer is poured slowly onto the center of the sheet and centrifugal force spreads it evenly over the surface. The cover of the whirler is fitted with electric strip heaters which supply a mild dry heat, accelerating the drying of the sensitizing solution.

Approximately ten minutes are required to thoroughly dry the plate. It is now sensitive to bright light but can be handled in subdued day light or artificial light. No dark room is necessary. The plate will stay sensitized without fogging from six to eight hours, permitting considerable flexibility in planning work through the process.

After the dry plate has been removed from the whirler, it is placed face up on the table of a vacuum printing frame, such as is commonly used in many photographic processes. It consists of a rubber blanket large enough to accommodate the entire plate over which is hinged a framed sheet of quarter inch plate glass. The glass frame is so hinged that when closed

it will seal tightly against a rubber beading around the edge of the blanket. Then, when air is exhausted between the glass and blanket by a vacuum pump and tank, atmospheric pressure forces the blanket against the glass at roughly fourteen pounds per square inch pressure.

Printing

Face up on the blanket the sensitized plate is covered with the negative applied face down. The glass frame is closed and the vacuum applied. This procedure insures absolute contact between the negative and the surface of the plate. Variations in metal thickness are compensated for by the resiliency of the rubber blanket.

The plate is now exposed through the negative to a source of white light. White flame carbon arc seems to be the most efficient illumination. Exposure time is about two minutes. The brilliant light passing only through the open portions of the negative, hardens the corresponding portions of the sensitized plate.

Removed from the printing frame the plate is placed face up on a flat level table and then developing liquid is applied. The developer dissolves the unexposed colloid leaving the original metal and the exposed image. Incidentally the developer must be absolutely free from water. Its presence at this stage would be disastrous to the image as is explained later.

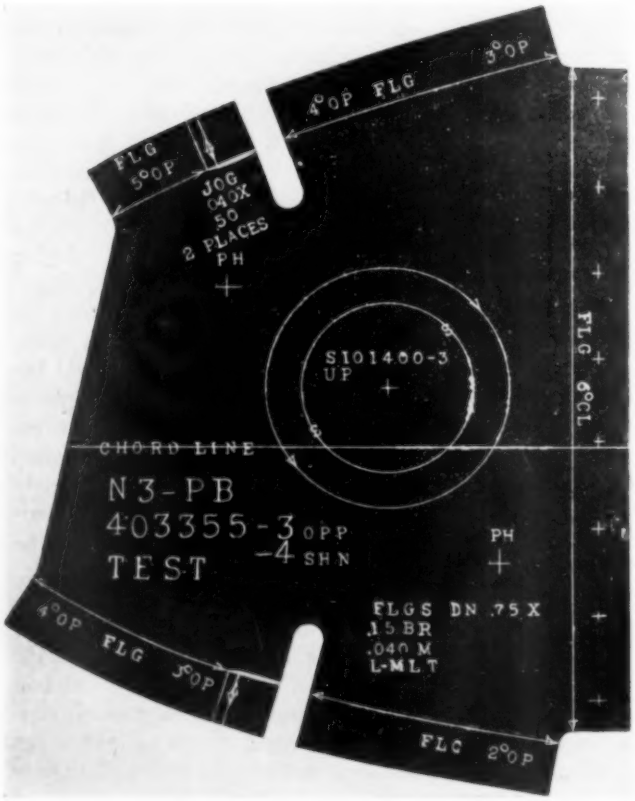
After complete development — about two or three minutes — the surplus developer is removed with a rubber squeegee. The plate is then thoroughly flushed with at least two applications of 200 degree anhydrous alcohol, stopping all action of the developer and removing its greasy film. The plate is inked in the same manner as the original templates but this time with the Norepro (Northrop Process) etching ink. It is now placed in a large sink and immersed in cold tap water, to which has been added a wetting agent making a two percent solution.

The acetate negative of a chrome-moly punch for a Kirksite blanking die.

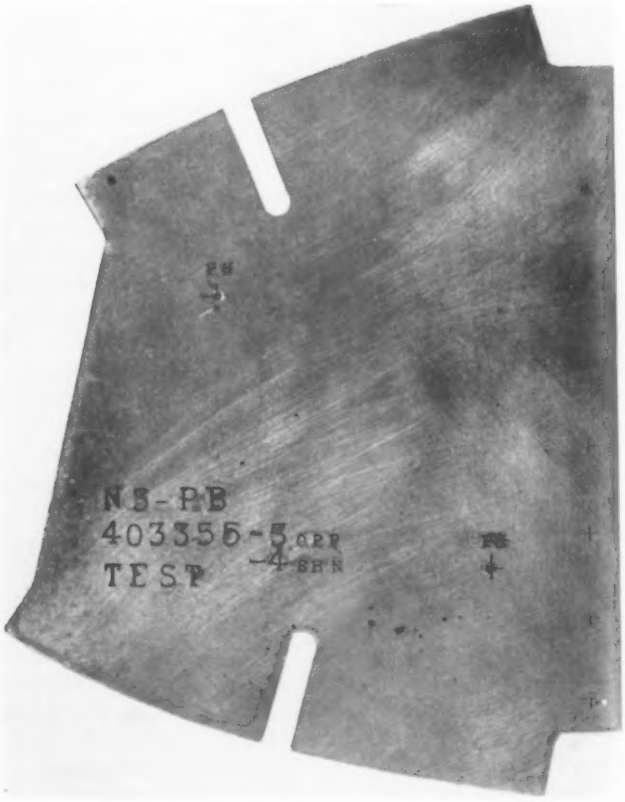
Duplication exact

The colloid image, hardened by light exposure, is soluble in water and washed away leaving the exact duplicate image of the original template. Fidelity of duplication is sometimes amazing. Hardly noticeable surface scratches in the original template, are picked up by the negative and transferred to the sensitized plate. These blemishes show up after the water rinse but may be eliminated by painting out in a later operation.

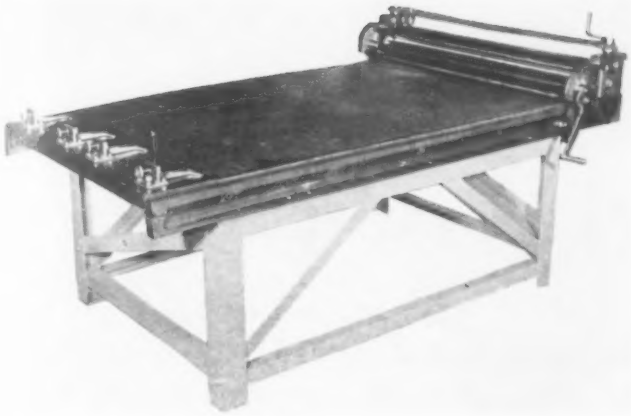
Because the etching ink is not soluble in water, only that which covered the hardened colloid was removed. Thus the plate's background is completely covered with a film of etching ink, leaving as bare metal only the scribed

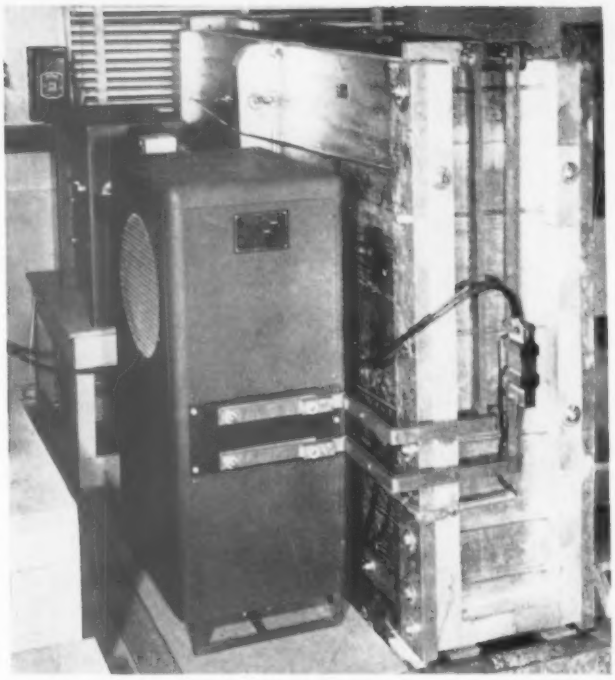


Made from the negative, the electrolytically etched duplicate is within .005 of an inch of the original.



The finished chrome-moly punch as made in the template department and sent to the tool shop for mounting.





Above
The Norepro press.

Right:
The etching machine.

Left:
The plate whirler.

lines and stamping of the original template.

By blotting with a chamois and then an air blast the plate is thoroughly dried. Etching ink contains a thermal setting synthetic, and the template must be baked to produce a tough and durable surface to withstand the action of the electrolyte. Baking is done in an electric oven at approximately 500 degrees Fahrenheit for about four minutes. The back of the plate is brushed or sprayed with a special etch resist, and the plate is ready for etching.

Etching process

Etching actually takes place in a machine resembling an ordinary electroplating tank. It differs in process however in that the work becomes the anode or positive pole. Lead sheet serves most satisfactorily as the cathode since it is unaffected by the action of the electrolyte. Many experiments were made with various kinds of electrolyte but in the end common sodium chloride or table salt proved most suitable. A concentrated solution gives the fastest results and coarse grained etched surfaces. This is entirely satisfactory for general template work but if finer grained etching is desired it can be obtained by diluting the solution with a resultant increase in etching time.

After five minutes the plate is removed from the tank. Lines and stamping have been etched to a depth of about five thousandths of an inch, which stands up satisfactorily under rough shop usage. These lines and stampings are next stopped off with resist asphaltum varnish, except for the outline or external contour of the template to be cut out. The plate is returned to the etch tank and remains there for approximately forty minutes, or until the metal is completely etched through. If the plate is removed from the etch tank at the right time the metal will be found to be entirely cut through and held together only by the tough varnish applied to the back of the plate. If the plate is removed from the tank a little too early it is necessary only to break the thin film of metal remaining between the template and the parent plate. If the plate is left in too long in the etching solution there is a tendency for excessive undercut on the template edge.

THE END

Advantages of Templates Produced by Electrolytic Etching

Exactness of scale: Templates can be produced accurate to within .005-inch in contour and absolutely accurate with respect to surface flaws.

Durable image: Etched image is far more durable, even than original template because lines and markings can be sunk to a greater depth than can be accomplished by hand scribes and stamping dies.

Eliminates hand cutting: Templates are etched completely, leaving only slight burr which is readily removed with file or sander. Etch time requires no man-hours. Block templates are not cut and filed in usual laborious method, but line is scribed on original layout.

Eliminates highly skilled labor: Process can be taught to anyone of average mechanical ability in 30 days, at most.

Low initial equipment cost: Duplicating laboratory can be set up to handle four by six plate for cost not exceeding $10,000.

Low operating costs: On a basis of group duplication, four by six sheet, templates can be produced at cost of less than 20 cents per square foot, including all material and labor.

Wear Allowances and Tolerances for

Inspection and Work Gages

FREDERIC S. WILCOX
CHIEF TOOL ENGINEER
J. STEVENS HILL PLANT
SAVAGE ARMS CORPORATION

Production engineers have asked for standard gage dimensions which allow for wear and specify limits for repair or discard. Here is a system that works.

IN THE MANUFACTURE of interchangeable parts, two classes of gages are required:

First—Inspection gages must at all times be within the basic limits set for the dimension being measured on a finished component part, though the gage maker has taken some tolerance in making the gage and some wear has occurred during use.

Second—Work gages are furnished to measure the piece as each operation is performed, keeping it of such dimensions that it will not be rejected by inspection gages.

The gage designer must set tolerance figures within which the gage maker will work and dimensions at which the gage inspector will reject the gage as being worn beyond use. He must specify dimensions which, with allowed tolerance and wear, will always keep the inspection gage within the basic, and keep the work gage within the inspection gage.

Gage sizes

Because of tolerance and wear, inspection gages are not always the same size. They cannot be used as work gages because pieces passed by slightly worn gages would be rejected later by an inspection gage nominally of the same size but actually enough different to reject a fairly large percentage of pieces. This is particularly true where parts made by a sub-contractor are inspected by the purchaser.

Work gages must therefore always be within the inspection gage dimensions in spite of tolerance and wear on both inspection and work gages.

To meet the above conditions, the tables in the chart on the opposite page show what allowances and tolerances should be applied to inspection and work gages of several types, in the range of tolerances from .0005 to .100-inches. The chart on this page shows the derivation of the tables.

No overlapping

Note that there is no overlapping between the ranges of the inspection and work gages to cause rejections by the inspection gage, and no space between them to cause unnecessary reduction of tolerance for the operator's use. To illustrate these allowances, a piece having a dimension of .250 with an allowable tolerance of plus .010, calls for a double snap gage with basic dimensions of .250 and .260 with tolerances, wear allowances and rejection limits meeting the above requirements. Because the basic tolerance is .010, all allowances are taken from the seventh line of the component tolerance column in Figure 1.

The minimum or No Go end of the inspection gage will be basic with tolerance of plus B (.250 - .0002). It is discarded when worn to a rejection limit of basic plus F (.2505). The maximum or Go end of the inspection gage will be basic minus C, with tolerance of minus B (.2595 - .0002). It is discarded when worn to the basic dimension (.260).

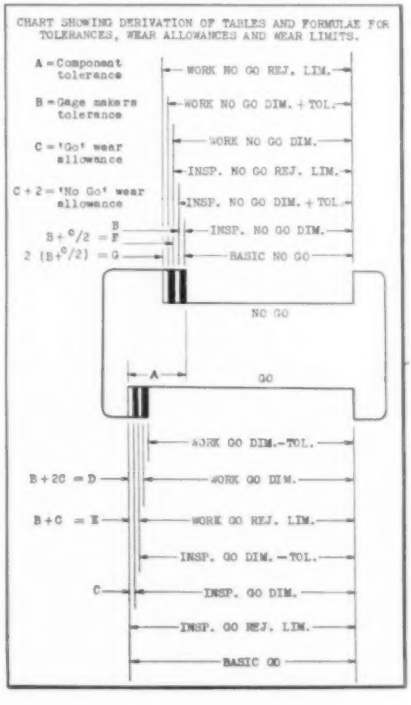


CHART SHOWING DERIVATION OF TABLES AND FORMULAE FOR TOLERANCES, WEAR ALLOWANCES AND WEAR LIMITS.
A = Component tolerance
B = Gage makers tolerance
C = 'Go' wear allowance
C + 2 = 'No Go' wear allowance
B + C/2 = F
2 (B + C/2) = G
WORK NO GO REJ. LIM.
WORK NO GO DIM. + TOL.
WORK NO GO DIM.
INSP. NO GO REJ. LIM.
INSP. NO GO DIM. + TOL.
INSP. NO GO DIM.
BASIC NO GO
NO GO
A
GO
WORK GO DIM. - TOL.
B + 2C = D
WORK GO DIM.
B + C = E
WORK GO REJ. LIM.
INSP. GO DIM. - TOL.
C
INSP. GO DIM.
INSP. GO REJ. LIM.
BASIC GO

Work gage limits

The minimum work gage will be basic plus F (same as inspection gage rejection limit) with tolerance of plus B (.2505 - .0002), with rejection limit of basic plus G (.2510). The maximum work gage will be basic minus D with tolerance of minus B (.2588 - .0002) with rejection limit of basic minus E (.2593).

This gives a range on the minimum or No Go of from .2500 to .2505 on the inspection gage and from .2505 to .2510 on the work gage. The maximum or Go end ranges from .2600 to .2593 on the inspection gage and from .2593 to .2586 on the work gage. Opinions will differ as to the amount of wear which should be allowed, but in these tables, approximately five percent is used for the Go gage and one-half as much for the No Go.

THE END.

Max. and min. dimensions to which gages are to be made, are found by adding to min. or subtracting from max. basic component dimension, allowance given in columns C, D, E, or F, as directed by column X.

The direction (+ or −) in which the gage maker is to apply the tolerance given in column B is specified for each type of gage in column Y.

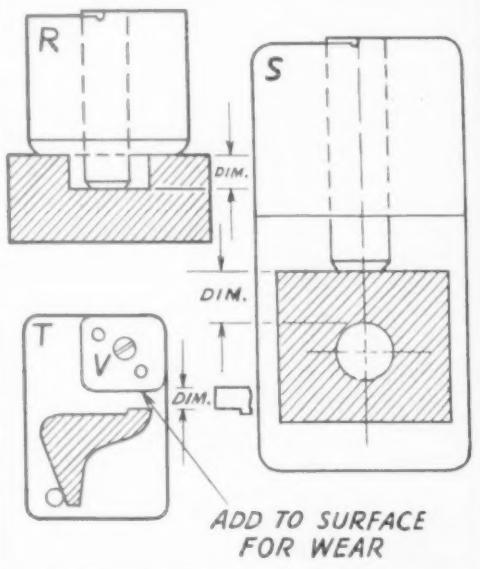
Rejection limits, at which dimension gage is worn beyond use, are to be specified by adding to min. or subtracting from max. basic component dimension allowance given in columns E, F, G or H as directed in column Z.

For type "T" gage add wear allowance "C" to block "V" and apply tol. "B" plus.

On the plug or feeler for type "T" gage, use allowance and tol. given for plug gages after first subtracting from max., allowance given in column E.

Mark gages with basic maximum and minimum dimensions.

	Dimension	Tol.	Rej. Lim.
Plug Gage	X	Y	Z
Inspection Go (min)	Basic + C	+	Basic
Inspection max.	Basic	-	Basic-F
Work min.	Basic + D	+	Basic+E
Work max.	Basic - F	-	Basic-G
Snap or Ring			
Inspection Go (max)	Basic - C	-	Basic
Inspection min.	Basic	+	Basic+F
Work max.	Basic - D	-	Basic-E
Work min.	Basic + F	+	Basic+G
Flush Pin Type "R"			
Inspection (max)	Basic	-	Basic-E
Inspection min.	Basic + C	+	Basic
Work max.	Basic - E	-	Basic-H
Work min.	Basic + D	+	Basic+E
Flush Pin Type "S"			
Inspection (max)	Basic - C	-	Basic
Inspection min.	Basic	+	Basic-E
Work max.	Basic - D	-	Basic-E
Work min.	Basic + E	+	Basic+H



A	B	C	D	E	F	G	H
Component Tolerance	Gage makers Tolerance	Go wear Allowance	B+2C	B+C	B+C/2	2(B+C/2)	2B+2C
.0005	.00003	.00002	.00007	.00005	.00004	.00008	.0001
.001	.00006	.00004	.00014	.0001	.00008	.00016	.0002
.002	.0001	.0001	.0003	.0002	.00015	.0003	.0004
.004	.0001	.0002	.0005	.0003	.0002	.0004	.0006
.006	.0002	.0003	.0008	.0005	.0004	.0007	.001
.008	.0002	.0004	.001	.0006	.0004	.0008	.0012
.010	.0002	.0005	.0012	.0007	.0005	.001	.0014
.012	.0003	.0006	.0015	.0009	.0006	.0012	.0018
.016	.0004	.0008	.002	.0012	.0008	.0016	.0024
.020	.0005	.001	.0025	.0015	.001	.002	.003
.024	.0006	.0012	.003	.0018	.0012	.0024	.0036
.028	.0007	.0014	.0035	.0021	.0014	.0028	.0042
.032	.0008	.0016	.004	.0024	.0016	.0032	.0048
.040	.001	.002	.005	.003	.002	.004	.006
.060	.0015	.003	.0075	.0045	.003	.006	.009
.100	.002	.004	.010	.006	.004	.008	.012

For plug, ring & snap gages not go wear allowance go wear allowance divided by 2.

For component tolerances not listed use next smaller tolerance.

GAGE MAKERS' TOLERANCES AND WEAR ALLOWANCES
FOR PLUG, RING, SNAP AND FLUSH PIN GAGES

Gage Control

A simple system for inspecting, maintaining and marking gages used in mass production

L. W. MACOMBER
GENERAL ELECTRIC COMPANY

AT ONE of the General Electric Company's New England plants, a gage checking system has been worked out for different types of jobs and production quantities, solving a problem which has always been complex on high production.

One to three men are employed in each department to see that gages are serially numbered, card indexed, taken from the job and inspected after the prescribed period in use, and returned to the job.

In a Kardex file, master cards describe the gage and show the serial number, inspection period, location and dates inspected. Another file of small cards (one for each gage) quickly indicates for each day the gages that are to be picked up for inspection. This is done by filing the cards by the future date of inspection. After inspection, the date is entered on the master card and the small card is set ahead to the next date.

Spare Gages

For short periods between inspection, a second gage, or sets of gages, is delivered to the job for use during the period. In some cases, several spares are in reserve.

For long periods, a spare gage is taken from stock and returned to stock after the regular gage is returned. These "spares" are so marked, are used for no other purpose and, therefore, wear slowly.

FIGURE 1.

Inspection Gages

At the start, the inspection is arbitrarily set for each tool for a certain time. After some experience the length of the period is changed to the longest time possible without excessive wear. These periods range from one day for snap gages with a tolerance of .0001, to six months for precision blocks.

FIGURE 2.

Thread gage periods range from two days to three weeks; micrometers one to three weeks; vernier calipers six weeks; snap gages one day to three weeks; contour gages three months.

Marking After Inspection

After the gage is approved, one or more spots of paint are applied to some particular part of the gage, subject to minimum handling wear. The larger spot is the color for the month and the smaller is the color for the week. When necessary, a third and smaller spot is applied, which is the color for the day of the week. Figure 1 shows a snap gage inspected in the 4th week in September.

For convenience, three small bottles are kept in a rack (Figure 2) two of which contain the month and week colors, while the third contains acetone. Small brushes are inserted through the rubber stoppers. The acetone is applied to soften the paint, after which it is wiped off with a rag.

FIGURE 3.

Metal color charts are made (Figure 3) and distributed to inspection areas, tool rooms, and to supervisors, so that the proper color for the period may be recognized.

The particular paint used dries in a few minutes, is very durable and is proof against any common solvent except acetone.

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The colors as used are:

JANUARY—**White**
FEBRUARY—**Purple**
MARCH—**Yellow**
APRIL—**Light Green**
MAY—**Red**
JUNE—**Light Blue**
JULY—**Pink**
AUGUST—**Dark Green**
SEPTEMBER—**Dark Blue**
OCTOBER—**Orange**
NOVEMBER—**Brown**
DECEMBER—**Gray**

First week: **brown**—Second week: **gray**—Third week: **yellow**—Fourth week: **white**—Fifth week: **black.**

Monday: **purple**—Tuesday: **dark blue**—Wednesday: **pink**—Thursday: **red**—Friday: **orange**—Saturday: **dark green**—Sunday: **light green.**

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This system of marking takes very little time to apply, and, with a little supervision, is practically fool-proof.

THE END.

The old "boxcar" tool numbering system has given way to a new method that reveals at first glance all that must be known about a tool to use it economically. The system solves the lost tool problem.

TOOL CONTROL
A Unified System

ETHAN W. VARS

TITAN METAL
MANUFACTURING COMPANY

CAN every person in your plant who works with tools tell by looking at a tool's number what part the tool was used to produce, from what drawing it was made, what detail on the drawing the tool is, to what cost number it was made, and how many like it had preceded the one under observation?

It seems evident that tools bearing information so complete cannot remain lost unless buried from sight. Any worker finding such a stray automatically knows the tool is of value, that it is a tool for making something, and that it should be taken to the tool crib or called to the attention of some official. In fact, because of such a numbering system, lost tools are so rare at the Titan Company's plant that the lost-tool problem has not been brought up since we began this system.

The change from the old "box-car" tool numbering idea to a unified system was achieved with no hold-up of deliveries to customers. There was, in fact, a noticeable and steady improvement throughout the plant as the change-over progressed.

Years of using the consecutive numbering system for assigning drawing numbers in the drafting room led us to believe "boxcar" numbers had no excuse for existence. There seemed to be little reason why a drawing number should not convey a lot of meaning; and the unified numbers we now use undeniably give us what we sought. There is no place where this system from design to the discarding of the tool or device fails to supply the information we need.

A brief outline of the Unified Tooling System now used by the Titan Metal Manufacturing Company is shown in Figure 1. Every identification number involved in designing, making, costing, and using the tool is tied to the number of the part the tool is to be used to produce. This eliminates at once any need for the cross-indexing headache in any department such as is always required if a "boxcar" number is used to identify a tool drawing. In fact, we do not even use a card file in our design room to record the number of drawings issued against any part number, as will be shown.

A Unified Tool System number tells what part the tool originally was made to produce, yet it does not cause any confusion if the same tool is used to produce an unlimited number of different parts. Since this plant is a jobbing shop, making and selling nothing under its own name, we have had a considerable variety to test this phase of the system.

Furthermore, without delaying production, we were able to change over from the old "boxcar" system, thus erasing on all active parts the confusion accumulated over a period of some twenty years. No problem except the temporary set-up needed to put it across was involved in changing over.

In the design room we are using the Bureau of Standards' designation

FIGURE 1.

THE UNIFIED TOOLING SYSTEM USED BY THE TITAN METAL MANUFACTURING CO.

An example of the system applied to a production part number made up of a letter and numeral, such as W-2:

W-2	— PRODUCTION PART NUMBER.
D-W-2-1	— TOOL DRAWING NUMBER OF FIRST SHEET OF DRAWINGS.
W-2-1-1	— TOOL NUMBER OF DETAIL ONE ON TOOL SHEET NUMBER ONE.
W-2-1-1A	— FIRST COST NUMBER OF DETAIL ONE ON SHEET ONE.
X-W-2-1-1A	COST NUMBER OF AN EXPERIMENTAL CHANGE MADE ON TOOL W-2-1-1.

The system applied in the same manner to a part number composed of plain numerals would appear:

9964	— PART NUMBER.
D-9964-1	— TOOL DRAWING.
9964-1-1	— TOOL NUMBER.
9964-1-1A	— COST NUMBER.
X9964-1-1A	— EXPERIMENTAL COST NUMBER.

DATE 4-2-41 — OPERATION SCHEDULE

OPER NO.	OPERATIONS	MCH	TOOLS — NAME	NUMBER	COST DETAILS	
6-1	SAW		SLUG SIZE	1 23/32 D		
			FEM DIE ASS'Y	9964-7-3	MALE DIE	9964-7-18
6-2	FORGE	F.P.	MALE DIE ASS'Y	9964-7-2		
			ADAPTER	2520-37-1	MALE PUNCH	9964-7-6
			" ASS'Y	" -2	FEM. DIE	9964-7-17
			BOLTS 13/16"	" -10	FEM. PUNCH	9964-7-16
-3	PICKLE					
67-7	BLANK	P.P.	DIE	9964-102	PUNCH	9964-121
67-4	FLAT DRILL, FACE CHAMF & TAP	C.M.	JAWS FOR CHUCK	9964-9-1	FLAT DRILL	9964-6-2
					TAP	9964-3-2
			FLAT DRILL ASS'Y	9964-6-1		
			PLUG GAGE	9964-3-3		
			PLUG THD GAGE	9964-3-4		
67-5	FIRST THD 1/2 STD TAPER PIPE— THEN CHAMF INSIDE & OUTSIDE	T.L.	COLLET	9964-4-2		
			COLLET PLUG	9964-4-3		
			STD 1/2 TAPER PIPE CHASERS & RING THD GAGE			
			CHAMF TOOL ASS'Y	9964-5-1		
67-6	ASSEMBLE WITH PARTS 80,163 & 80,164			2534-1		

DATE		REVISIONS
4-2-41	1	SCHEDULE SHEET REVISED
7-28-41	2	67-4 WAS-T. LATHE
11-3-41	3	DET. 9964-7-4 & -5 REMOVED
"	4	" 9964-7-19 ADDED
1-8-42	5	OPER. 67-7 ADDED - FLASH WAS REMOVED ON OP. 67-4

EST. WEIGHT .135 — MAT.
ACTUAL WEIGHT — FLASH .046
DWGS. ASSIGNED — MARK A B C O R D
NAME OF PART 1/2 BODY-TYPE "A"
PART NO. 9964

FIGURE 2.

for drawing sizes: "A" for 8½ inches x 11 inches, to "D" for 24-inches x 36-inches, and we refuse to make any tool drawing wider than the standard 24-inches. With this system we need not do so because, when we need more space, we use another departure in the system and "tie together" any number of sheets which are then considered as one drawing. The "Master" drawing number of such a sheet might be, for example, D-2580-lac. This happens to be the main assembly drawing of a machine we are designing. Using quarter scale the different views go nicely on a "D" size drawing, and as additional sheets are used they are numbered D-2580-1b, D-2580-1c, and so on, the first, or master sheet indicating that three sheets were used in this instance.

Every machine designer knows how convenient it would be on a large design job if he could group his drawing numbers more effectively. He has had the experience of allowing too little paper space to show all the views needed for some part of his machine. The result is, when using the "boxcar" system, that he may even be forced to reduce the scale of his views and redraw or replan the whole thing, a costly and dangerous practice. There is no need to do this when he can resort without confusion to the above described practice of assigning just any number of the additional sheets he needs.

If dashes already appear in a part number, it is necessary to divide the built-up number with any other dissimilar device as may suit the individual shop, as illustrated in Figure 1.

On the drafting end all the control needed to prevent issuing the same sheet number more than once is incorporated in the design of the Operation Schedule for the part (See Figure 2). Based on average requirements, the block of space above the part number provides seventeen numerals, which are to be crossed off as tool drawing numbers are needed. At the time a number is crossed off, the letter size of the sheet being used is placed before that number. This is the complete and only record of the number of drawings issued to tool up a part. It is of no concern to us that we never can recite the total of the number of all drawings made these past seven years, yet this appears as about the only fact the old "boxcar" system afforded.

For men whose duty it is to "dig up" the tracings, here is a note on time-saving: All the drawings ever issued to make all the tools for a given part will be found *together* in the drawing file. Without reference to even the Tool Schedule, you can go to the vault and by looking in just four places for the four standard sheet sizes, "A" to "D", you can find every drawing ever issued against that part number. The value of this convenience in making sure the best designs are followed on similar jobs is no small item.

Covers any gadget

This method of issuing numbers offers another unusual and valuable result. Tool numbers can be issued for any gadget whatever which somebody in the shop has devised or found useful in getting a job done, and which would be lost or forgotten if not properly stamped, added to the Tool Schedule, and so put away for future use. Any set-up man can call for a tool number. He tells what operation the tool will be used on so it can be recorded as a permanent tool on the Schedule. In giving him the number, the next unused numeral, on the Schedule can be crossed off, write "no dwg." ahead of the numeral, and the job is done. Every tool man knows how expensive it would be — and how useless — to sketch up all those "spur-of- the-moment" devices a job shop uses to get the job out. Yet every shop has to contend with the problem of keeping track of such unusual tools.

So much for designing the tool. Let's see what can be done to keep the design room informed as to the performance of the tool. Figure 3 shows what developed from that need; it enables us to create a cost number by

the mere addition of a letter to the already existing tool number.

Before we discovered this simple way of creating a cost number, a five numeral "boxcar" number was being used. The old W-2-24683 stamping used nine spaces and told us nothing more than the part number and cost number. The cost number, W-2-3-8F, however, in eight spaces tells us the tool is the sixth one made to detail eight on the third drawing issued to tool up Part W-2.

On the pages of a loose leaf notebook, such as shown in Figure 3, we can record all the cost numbers that will ever be issued to make the tools for a given part number, starting with the letter "A" in every case. The part number is recorded in the upper right hand corner; the number of the sheet of tool drawing is placed at the head of a column; then each detail requiring a cost letter is recorded down the left side of the spaces, as illustrated. The number of the Shop Order is placed beside the cost letter, as shown.

COST NUMBERS — PART No. 9964 — PAGE 1 OF 4 PAGES

DET.	DWG. 7	DET.	DWG. 7
4	A 6794	17	A 6794
		19	A 6794 SHRINK FIT 4.337 D
5	A 6794		
6	A 6794		
9	A 7130		
16	A 6794		

FIGURE 3.

A number of benefits accrue from such an arrangement. The most interesting perhaps is, we repeat, the fact that all the tools and their cost numbers *ever* to be made for a given part number will be listed on this same page — or a series of them if the size of the job demands more space. This device replaced a book which opened up about three feet wide and demanded about that yardage of writing for every cost number. Obviously, a tool made a few years ago and recorded in such a book is a dead record, while on this form the information concerning the job is available as long as we leave the pages in the notebook. Perforations are provided on both edges of each page, and only one side of the sheet should be used.

But what we really were searching for, and got, from Figure 3 is a device which enables us to know what size variations in the previous tool have to be allowed for when making replacement items for the tool. For tools do wear, and slips will occur in making the tool, yet the tool is perfectly usable. If a replacement for a forge die insert, for instance, was made to the exact original drawing dimensions, it would be found to be too small to shrink properly into the die holder. Nor do we want to hold the die out of service while we measure the hole and turn off the diameter of the insert.

To avoid all this, the dimension used to fit up the latest insert is recorded in the space used for that detail and opposite that insert's cost letter, where it is sure to be seen when assigning a cost letter to the next replacement die insert. The estimator crosses off the old original dimensions for such a detail on the tool drawing and substitutes the new size. Thus we do not have to be changing the variable sizes back and forth on the tool drawing, and the control rests in the Tool Room where it must rest to be effective. Note the 4.337-inches diameter of detail 19 on drawing 7 for Part 9964, Figure 3, which illustrates this feature.

How well are the tools designed, is the question every design room wants answered. Everybody wants long operating life and freedom from maintenance. This system follows through here too and tells us whether we have those things. Figure 4 shows the Discarded Tool Record furnished by those in charge of production tool records. On it are recorded the customary facts relating to when a tool went into service, when it came out and why, the production total and any suggested changes. There is nothing unusual about the card itself; yet the way these cards file away in sequence by the cost letter of this unified system gives a

DISCARDED TOOL CARD COST No. 9964-7-19A
FIRST USED DATE 9-3-41 FAILED DATE 9-20-41
TOTAL PCS. PRODUCED 49,968 No. TIMES RUN 2

REASON DISCARDED -- WORN - BROKE - BENT - CRACKED - UPSET - TOO SOFT - TOO HARD - ENG. CHANGE - PART DWG. CHANGED - DWG. ERROR - TOOL ROOM ERROR

SUGGESTED CHANGES:

ENG. NOTES -- (SK. ON OTHER SIDE)
FIRST DIE FOLLOWING ENG. CHANGES.
PREVIOUS DIE LIFE 13,460 AVERAGE.

-- SEND TO ENG. DEPT. FOR EVERY DISC. COST TOOL

FIGURE 4.

TOOL CORRECTION REQUEST
(Use only to put a tool or die into usable shape).

Tool No. 9964
Date Issued 4-18-40

DESCRIPTION OF CORRECTIONS WANTED:

Die pulled apart.

Please repair.

Date Wanted Rush Signed M Baxley
Completed Date 4-18-40 Tool Room -- mail this form to

(4)

FIGURE 5.

compact easily read history, which has enabled us all along to revise designs and gain truly unbelievable increases in tool life.

Still another feature of vital importance to Tool Engineering is given us by this system, in that we are able to make experimental changes in design without interfering with production and without tampering with the design as recorded on the original tracing or the tool.

To do this we make a "white print" of the tool drawing, and on this print we draw the revisions wanted. This is done with a colored pencil of bright hue, and we paint out the lines of the original design with "white ink" as needed to gain clarity. We put an "X" ahead of the tool sheet number and also place an "X" at the head of the tool number to be stamped on this experimental tool. Since all tool-life information will return to us on the card shown in Figure 4, we are sure to learn what benefits were received from the experiment, even if nobody was able to be on hand when the tool was being tried out. These "X" cards file away right beside those which record the production from our standard design, so we have an immediate picture of whether or not the design change was a good thing.

The discarded tool information is supplemented most effectively by the "Pink Slip" shown in Figure 5. They themselves are nothing new either, but here again the fact such a slip bears the part number enables us to file these away right beside the tool cards bearing the tool numbers for the part. A red line anywhere in the Discarded Tool File means trouble is being experienced with that specific tool and that immediate action should be taken to improve the design.

It is to be seen that such performance records reach the Engineering Department while the part is still in production. Thus we are able to observe the tools in action, which is many times more effective than the examination of cold records. These slips are issued by a shop foreman for every kind of work he wants the tool room to perform on tools already made. All pink slips are sent to the engineering department by the tool room after their work is finished. We sort out and file away only those slips which obviously relate to tooling troubles.

To change over to the system described is comparatively easy to do. At the Titan Company's plant, after we had waded through a greater share of the active parts, the management issued orders that from a certain deadline date no production part would be worked on in the plant unless it was properly scheduled. Few exceptions had to be made to the ruling. Even now, once or twice a year some old part not scheduled is ordered. Out come the instructions again, the revisions are made, and the order filled.

And so, from the design-board to the discarding of worn-out tools, we have a Unified Tool Control System which requires almost no clerical time to keep up to date; because almost all the information which has value for future use is recorded as a part of the job of producing either the design of the tool, or the tool itself.

THE END.

LAMP ON TIMER SIMPLIFIES OPERATION

● NUMEROUS POSSIBILITIES for speeding production on automatic machine operations are suggested by this small lamp mounted on and connected to an automatic timer to simplify a shaft finishing operation. The lamp and timer are attached to a burnishing machine in one of the General Electric Works shops.

When sufficient time has elapsed to provide the necessary finish on the shaft, the small light warns the operator that the process has been completed. Results are considerable savings in time and minimizing of spoilage of metal.

PRODUCTION DATA SHEET

WELDING PREHEATING CHART

Benefits of Preheating Prior to Welding:

1. Eliminates the danger of formation of cracks.
2. Reduces hardness,
3. Reduces distortion.
4. Reduces or prevents shrinkage stresses.

The Need for Preheating Increases as the Following Factors are Changed:

1. The larger the mass being welded.
2. The lower the temperature of the pieces being welded.
3. The lower the atmospheric temperature.
4. The smaller the weld rod in diameter.
5. The greater the speed of welding.
6. The higher the carbon content of the steel.
7. The higher the manganese content.
8. The greater the alloy content in air hardening steels.
9. The more the air hardening capacity of the steel.
10. The greater the difference in mass between the two pieces being joined.
11. The more complicated the shape or section of the parts.

METAL GROUP	APPROXIMATE COMPOSITION — PERCENT								METAL DESIGNATION	RECOMMENDED PREHEAT
	C.	Mn.	Si.	Cr.	Ni.	Mo.	Cu.			
PLAIN CARBON STEELS	BELOW .20								PLAIN CARBON STEEL	UP TO 200°F
	.20-.30								PLAIN CARBON STEEL	200°F-300°F
	.30-.45								PLAIN CARBON STEEL	300°F-500°F
	.45-.80								PLAIN CARBON STEEL	500°F-800°F
CARBON MOLY STEELS	.10-.20					.50			CARBON MOLY STEEL	300°F-500°F
	.20-.30					.50			CARBON MOLY STEEL	400°F-600°F
	.30-.35					.50			CARBON MOLY STEEL	500°F-800°F
MANGANESE STEELS	.35	.80	.25						SILICON STRUCTURAL STEEL	300°F-500°F
	.20-.25	1.0-1.75							MEDIUM MANGANESE STEEL	300°F-500°F
	.30	1.75							SAE T 1330 STEEL	400°F-600°F
	.40	1.75							SAE T 1340 STEEL	500°F-800°F
	.50	1.75							SAE T 1350 STEEL	600°F-900°F
	1.25	12.0							12% MANGANESE STEEL	USUALLY NOT REQUIRED
HIGH TENSILE STEELS (SEE ALSO STEELS ON REVERSE SIDE)	.20	1.65	.20			.35			MANGANESE MOLY STEEL	300°F-500°F
	.35 MAX.	1.50	.30				.40		JALTEN STEEL	400°F-600°F
	.30 MAX.	1.35	.30				.20		MANTEN STEEL	400°F-600°F
	.12 MAX				.50 MIN.	.05 MIN.	.35 MIN.		ARMCO HIGH TENSILE STEEL	UP TO 200°F
	.12 MAX.	.75			.50-1.25	.10 MIN.	.50-1.50		DOUBLE STRENGTH #1 STEEL	300°F-600°F
	.30 MAX.	.75			.50-1.25	.10 MIN.	.50-1.50		DOUBLE STRENGTH #1A STEEL	400°F-700°F
	.12 MAX.	.75	.35	.2-1.0	.25-.75		.60		MAYARI R STEEL	UP TO 300°F
	.12 MAX.	1.25	.10 MAX.	.10 MAX.			.50 MAX.		OTISCOLOY STEEL	200°F-400°F
	.15-.25		.75	.60	.17	.15 MAX.	.25 MAX.	Zr. .12	NAX HIGH TENSILE STEEL	UP TO 300°F
	.14 MAX.	1.25	.75	.50					CROMANSIL STEEL	300°F-400°F
	.11-.14						.40		A. W. DYN-EL STEEL	UP TO 300°F
	.12 MAX.		.25-1.0	.5-1.5	.55 MAX.		.40		CORTEN STEEL	200°F-400°F
	.12 MAX.	.75		.75	.75		.55		CHROME COPPER NICKEL STEEL	200°F-400°F
	.40	.90		.40					CHROME MANGANESE STEEL	400°F-600°F
	.05-.35	.3-1.0			1.75		1.0		YOLOY STEEL	200°F-600°F
	.12 MAX.	.6	.3 MAX.		.55		.9-1.25		HI-STEEL	200°F-500°F

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METAL GROUP	APPROXIMATE COMPOSITION — PERCENT								METAL DESIGNATION	RECOMMENDED PREHEAT
	C.	Mn.	Si.	Cr.	Ni.	Mo.	Cu.			
NICKEL STEELS	.10-.20				.50				SAE 2015 STEEL	UP TO 300°F
	.10-.20				1.50				SAE 2115 STEEL	200°F-300°F
	.10-.20				2.50				2½% NICKEL STEEL	200°F-400°F
	.15				3.50				SAE 2315 STEEL	200°F-500°F
	.20				3.50				SAE 2320 STEEL	200°F-500°F
	.30				3.50				SAE 2330 STEEL	300°F-600°F
	.40				3.50				SAE 2340 STEEL	400°F-700°F
MEDIUM NICKEL CHROMIUM STEELS	.15			.60	1.25				SAE 3115 STEEL	200°F-400°F
	.25			.60	1.25				SAE 3125 STEEL	300°F-500°F
	.30			.60	1.25				SAE 3130 STEEL	400°F-700°F
	.40			.60	1.25				SAE 3140 STEEL	500°F-800°F
	.50			.60	1.25				SAE 3150 STEEL	600°F-900°F
	.15			1.00	1.75				SAE 3215 STEEL	300°F-500°F
	.30			1.00	1.75				SAE 3230 STEEL	500°F-700°F
	.40			1.00	1.75				SAE 3240 STEEL	700°F-1000°F
	.50			1.00	1.75				SAE 3250 STEEL	900°F-1100°F
	.15			1.50	3.50				SAE 3315 STEEL	500°F-700°F
	.25			1.50	3.50				SAE 3325 STEEL	900°F-1100°F
	.35			.75	3.00				SAE 3435 STEEL	900°F-1100°F
	.50			.75	3.00				SAE 3450 STEEL	900°F-1100°F
MOLY BEARING CHROMIUM AND CHROMIUM NICKEL STEELS	.40			.95		.20			SAE 4140 STEEL	600°F-800°F
	.40			.65	1.75	.35			SAE 4340 STEEL	700°F-900°F
	.15				1.80	.25			SAE 4615 STEEL	400°F-600°F
	.30				1.80	.25			SAE 4630 STEEL	500°F-700°F
	.40				1.80	.25			SAE 4640 STEEL	600°F-800°F
	.20				3.50	.25			SAE 4820 STEEL	600°F-800°F
LOW CHROME MOLY STEELS	UP TO .15			2.0		0.5			2% Cr.-½% Mo. STEEL	400°F-600°F
	.15-.25			2.0		0.5			2% Cr.-½% Mo. STEEL	500°F-800°F
	UP TO .15			2.0		1.0			2% Cr. 1% Mo. STEEL	500°F-700°F
	.15-.25			2.0		1.0			2% Cr. 1% Mo. STEEL	600°F-800°F
MEDIUM CHROME MOLY STEELS	UP TO .15			5.0		0.5			5% Cr.-½% Mo. STEEL	500°F-800°F
	.15-.25			5.0		0.5			5% Cr.-½% Mo. STEEL	600°F-900°F
	.15 MAX.			8.0		1.0			8% Cr.-1% Mo. STEEL	600°F-900°F
PLAIN HIGH CHROMIUM STEELS	.10			13.0					12-14% Cr. TYPE 410	300°F-500°F
	.10			17.0					16-18% Cr. TYPE 430	300°F-500°F
	.10			26.0					23-30% Cr. TYPE 446	300°F-500°F
HIGH CHROME NICKEL STAINLESS STEELS	.07			18.0	8.0				18% Cr. 8% Ni. TYPE 304	USUALLY DO NOT REQUIRE PREHEAT BUT IT MAY BE DESIRABLE TO REMOVE CHILL
	.07			25.0	12.0				25-12 TYPE 309	
	.10			25.0	20.0				25-20 TYPE 310	
	.07			18.0	8.0			Cb. 10XC	18-8 Cb. TYPE 347	
	.07			18.0	8.0	2.5			18-8 Mo. TYPE 316	
	.07			18.0	8.0	3.5			18-8 Mo. TYPE 317	
IRONS									CAST IRON	700°F-900°F
									Ni RESIST	500°F-1000°F
NON FERROUS									ALUMINUM	500°F-700°F
									MONEL	200°F-300°F
									NICKEL	200°F-300°F
									INCONEL	200°F-300°F
									COPPER	500°F-800°F
									ZINC	200°F-300°F

NOTE: On this and the preceding page is the fifteenth of a series of Data Sheets to be published in THE TOOL ENGINEER. A handy three ring binder can be secured at any dime store to hold the sheets for quick reference.

Men, Materials and Machines

Here is a production-stimulating program that should interest every production engineer who must deal with the manpower problem now or after the war. Results have included a 610 per cent increase in output.

"WORK TO WIN!"

WALLACE A. SCOTTEN
ASSOCIATE EDITOR

"IT IS VERY LITTLE to ask of a war worker that he does his job 60 minutes of every hour he is on duty in order to give our fighters an even chance against the enemy. That's all we expect of Packard employees — that, and the application of their intelligence, so that we may produce more or better quality with the same or less physical effort."

The speaker was big, amiable George T. Christopher, President and general manager of Packard Motor Car Company, who leaned across his desk in the heart of the erstwhile automobile manufacturing plant in Detroit to tell the story of one of the most amazing production achievements in the war effort.

Though figures on actual increases in units produced are censorable, suffice it to say that shipments of Packard-built Rolls-Royce engines increased 610 percent last year, while the output of Packard marine engines jumped 260 percent. In fact, the company turned out more power plants in 1942 than it did during the entire World War One, when it was the largest producer of the famous Liberty engine.

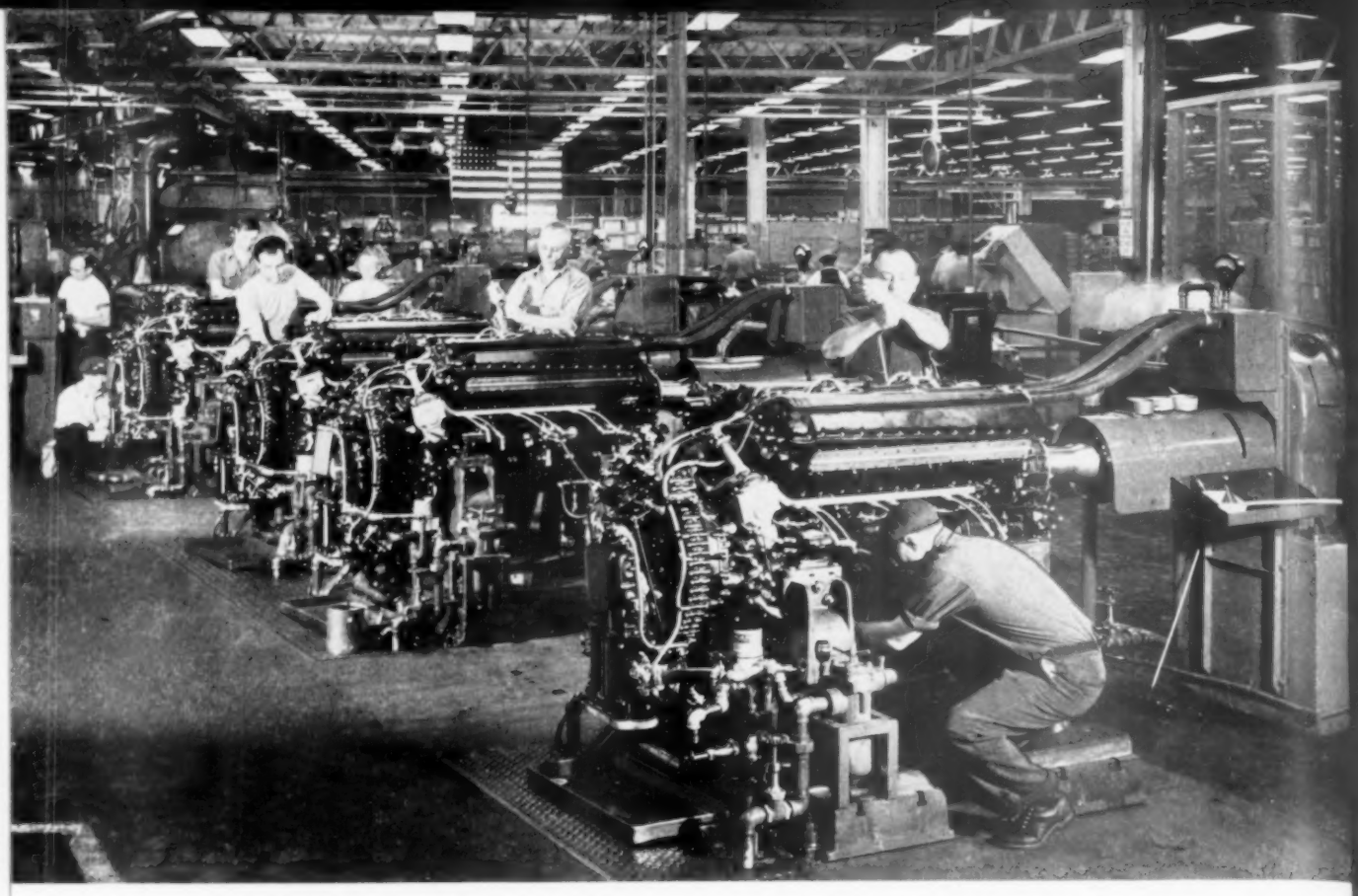
In new and revised production machine setups, largely suggested by the men who work at those machines, lies the answer to this record. And back of this worker demand for more production per machine is one of the outstanding examples of exemplary management-employee relations programs developed in American industry before or during the war.

Packard Motor Car Company photos

Packard's production-minded president, George T. Christopher, presents a production-idea award to I. A. Clark. A metal polisher, Clark developed a polishing stand which saves 1.2 hours per engine. Christopher, born in a log cabin, rose the hard way in the motor industry. "Work to Win!" is his baby.

The program, which Packard calls "WORK TO WIN!", is Christopher's baby. When discussing the program this old-time production engineer really becomes enthusiastic. Disregarding the long-standing principles on which most worker-employer relations have been based to date, this producer of war material for the United Nations has taken labor into the councils of production.

No white collar executive, but a hell-bent-for-election production engineer who went to work for 17 cents an hour in his first factory job and pulled himself to the top of the pile of good mechanics who form the back-



A precision mass production job if there ever was one is Packard's manufacture of the Rolls-Royce aircraft engine. These units, which have almost 11,000 parts, are shown here receiving a "motoring in" check before going to dynamometer cells for final tests.

bone of industrial America, Christopher attacked the problem of increasing production by taking the matter up with the man at the machine.

As evidence of the satisfactory results of this approach, he shoved across his desk a statement from the War Production Board. It showed that out of a total of 141 awards of Certificates of Individual Production Merit and Honorable Mentions made to date by Donald Nelson's War Production Drive office, to workers in 1,600 plants with Management-Labor Committees, 27 have gone to his own boys. The awards were the first given to workers in the automobile industry. One out of every five awards made to all plants in the country has gone to Packard, now engaged in making marine engines for the U. S. Navy's deadly PT boats of Lieut. Bulkeley fame, as well as aircraft engines already mentioned. This one auto plant has led all others in the country since the awards were started last September.

Aimed at saving precious hours of labor and machine time that might be devoted to other operations, Packard employee production ideas have been made available by the WPB to all war goods manufacturers.

Production suggestions from Packard now average more than 1,500 monthly, and better than 30 percent deal with practical shop hints or production shortcuts. Last month, these suggestions totaled 11,566, including 5,046 of a mechanical nature. Of these, 919 have been put into shop effect, and 1,038 are under consideration.

No monetary award is granted an accepted suggestion. Thus, all are motivated by patriotic impulse and production interest. Since the majority of Packard employees work on cost-plus contracts, any savings made by their suggestions redound to their government and, in the last analysis, to themselves as taxpayers helping to foot the war bill.

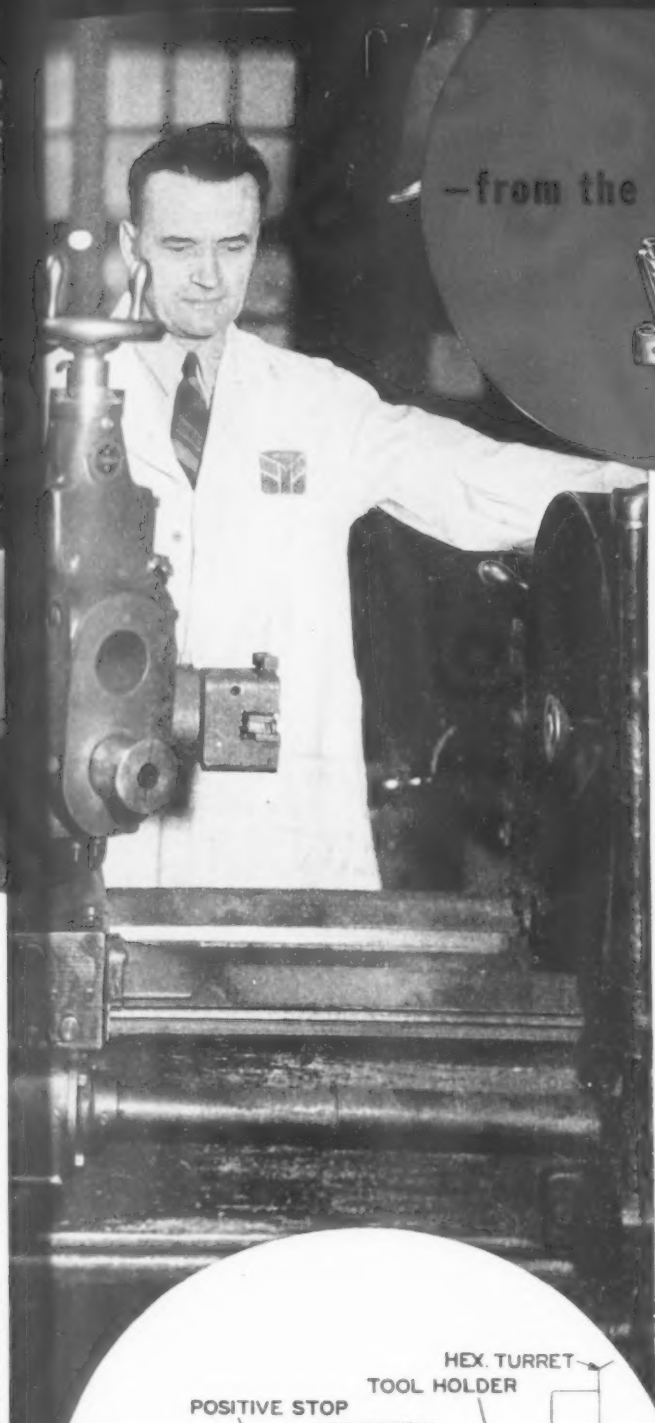
Typical suggestions

What kind of suggestions can the man at the machine make that will step up production? Here are a few. A thirty-three year-old machinist suggested a fixture to assure the accuracy of a previous facing operation and the finish grinding of the wrist pin hole of a connecting rod. Results include substantial savings of time and material. A 36 year-old superintendent of the salvage department designed fixtures for alignment of reduction gear bearing races and gear casing. Hours of production time were saved and one machine was freed for other work. A milling machine operator in the Aircraft Division offered a change in a machining operation, which increased its production 80 per cent.

Multiply any of these ideas by several hundred and you may get some conception of the speedup of machines that has taken place.

The Packard plan has been a speedup of machines and not of men. Curt Murdock, president of the union local in the Packard plant, is 100 percent behind this new idea in employee effort. "There are very definite limits to the endurance of a man," he says, "but there is no limit to the production you can get out of a machine if you use intelligence and resourcefulness."

Part of Christopher's program is to give full protection to the worker whose suggestions may prove patentable. The worker gives shop rights to Packard, but retains the sole right to patent his suggestion and grant licenses to others. The company freely counsels with employees whose suggestions seem to hold patent interest



Ideas for VICTORY

—from the Production Lines behind the Firing Line

IDEAS FOR VICTORY — AWARDED BY WARNER & SWASEY

A Citation for Men in War Industry

HIS METHOD STEPPED UP PRODUCTION OF 20 MM. SHELLS

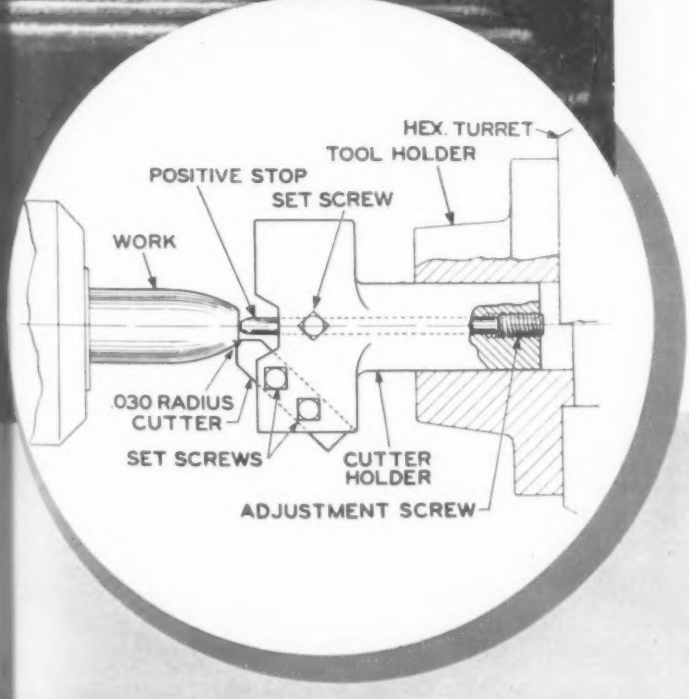
MANY machine tool operators deserve a lot of credit for applying individual ingenuity and resourcefulness to speed war production.

Such an operator is Chas. F. Marshall, setup man at the Oliver Farm Equipment Co., South Bend, Ind.

Operator Marshall developed a tool for machining a .030" radius on 20 mm. shells (see sketch). Because a stop is built right into the tool and locates from a finished face on the work piece, no particular care need be taken in loading work of slightly varying lengths into the spindle. Time was saved, accuracy improved, and production increased about 20%.

In addition to the Victory Pin, presented by Warner & Swasey, Mr. Marshall has been rewarded with a war bond by his company.

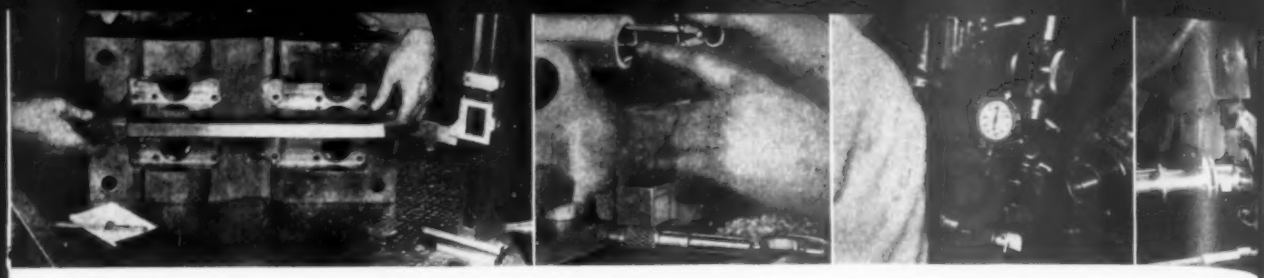
Many turret lathe operators have written us, telling how they have used the machines and tools at hand to best advantage. Many of these ideas are passed along in Blue Chips, a shop bulletin now being mailed free to the homes of over 38,000 turret lathe operators. Are your operators on this mailing list? Write Warner & Swasey, Cleveland, Ohio.

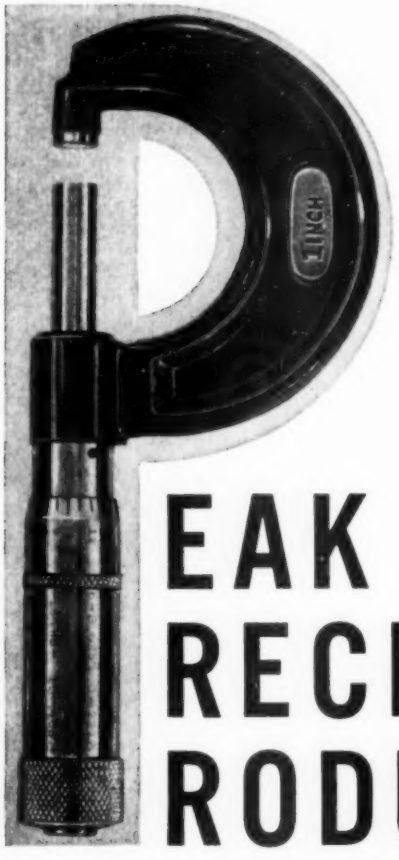


WARNER & SWASEY FOR VICTORY

YOU CAN TURN IT BETTER, FASTER, FOR LESS..
WITH A WARNER & SWASEY

STARRETT TOOLS





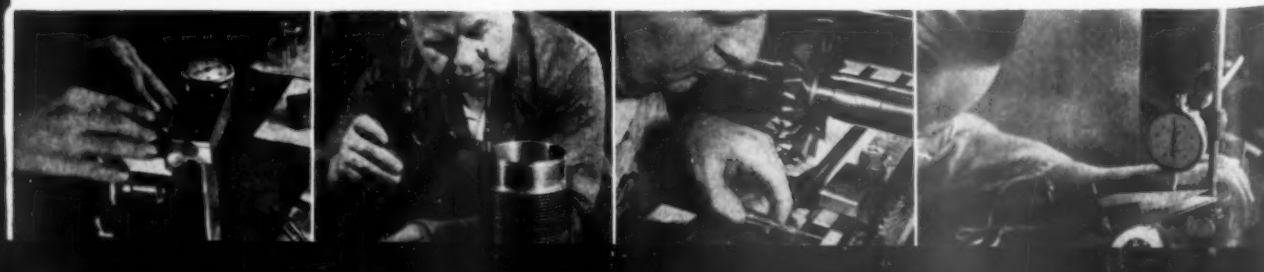
PEAK PRECISION PRODUCTION...

can be maintained only when men have the right tools for the job *plus* complete confidence in those tools . . . STARRETT is working day and night to meet the urgent demand for precision tools occasioned by the war effort. At the same time the STARRETT standards of accuracy and workmanship that men have long learned to count upon are being strictly maintained . . . You may continue to put your trust in Starrett Tools.

THE L. S. STARRETT CO., ATHOL, MASSACHUSETTS, U. S. A.

World's Greatest Toolmakers

Precision Tools • Dial Indicators • Ground Flat Stock • Hacksaws • Metal Cutting Band Saws • Steel Tapes



and, at its own expense, has made patent searches for some of them.

One reason for the success of this suggestion campaign is its fair method of idea analysis. All suggestions are submitted on a standard form, in a sealed envelope, dropped into a locked box. A numbered stub is retained by the worker, whose suggestion on a duplicate-numbered form is reviewed by the Management-Labor Committee, checked for practical shop application and judged solely on merit, since the suggestor's name is not even known until a decision has been reached.

The "WORK TO WIN!" program, of which production suggestions is only a part, is truly a sociological venture which should interest every production engineer who must deal with the manpower problem now or after the war.

Joint dinners

One of the more dramatic phases of the scheme includes a series of joint dinners for company supervisors and union representatives so that all employees will *"know and understand company policies and course of action."* The idea, here, is for both groups to hear the same story, at the same time, in the same way, and thus *"clear the air and cut the double-talk that can slow up production."*

Factory-reared Christopher isn't ashamed to tell his fellow industrialists in the motor capital that he eats at the same table with shop stewards. At a recent gathering of Detroit's Adcraft Club he squelched the bogey-belief that the net result of Management-Labor Committees would be union demands for a voice in the operation of business. "None of the feared things have come up," he told this gathering of business leaders. "Management doesn't want to run the union, and the union doesn't want to run the business."

This program is nothing more than a straightforward production drive. No attempt is made to conceal this fact. Significantly, it was created more than a month before Donald M. Nelson issued a national directive on the subject.

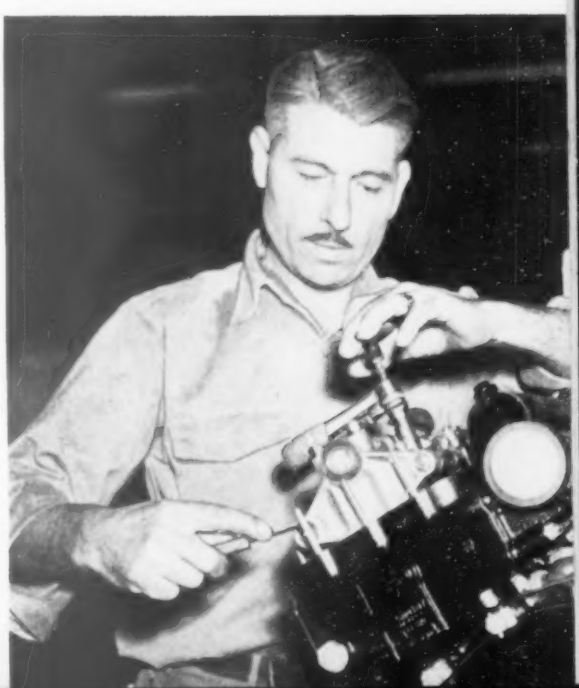
The plan was conceived on the principle that labor and management should operate in a manner mutually beneficial. Neither should request anything from the other that would be unreasonable. Participation in the

Harry Gielniak, tool crib attendant, is shown in his tool crib as he replaces a micrometer.

He suggested a change in the issuance of tools so that diamond tools are held by each employee for the life of the tool and brought about a saving of $16,000 a year.

Packard's George Smolarek was honored by President Roosevelt at a White House ceremony. Operator of a turret lathe, he was one of the early contributors to the "Work to Win!" production drive.

His suggestion, a shortcut which combines into one operation the work formerly done in two, has been cleared through WPB for time-saving use by many defense plants throughout the country.



Frederick Ospedale is shown setting tappets on a Rolls-Royce engine. He redesigned a wrench for a single operation, reducing the time of the operation 50 per cent.

He is one of 27 Packard workers whose production speeding suggestions won them nearly one quarter of the awards made to date by the War Production Board.

plan is purely voluntary, and its operation functions under a steering committee composed of labor and management representatives, both with an equal voice.

Fundamentals agreed upon were, first, 60 minutes of work for 70 minutes of pay and, second, through intelligent application without unreasonable effort, more efficient work.

These aims are achieved through three methods, education, inspiration, and competition. Education consists of publicizing to the entire organization their respective responsibilities. The inspirational program keeps everyone informed of the results accomplished. The competitive feature embodies friendly rivalry between departments and compares their progress on basis of efficiency, output and costs.

The plan saw its inception on January 19, 1942, when Christopher addressed a memorandum to a number of his associates on the subject "Work To Be Considered For Shop Betterment." The essence of his idea was to set up a system that would bring all the organization into plan operation, then develop a program so established that records may be set only to be broken by better ones.

Details of the plan were worked out at meetings of management and labor. These resulted in a program which was the first of its sort to be drafted in the auto-aircraft industry. This was followed by the establishment of a joint Management-Labor Committee, said to be the first in the automotive industry. Packard officials point out that the Committee functions independently and overlaps in no way the established union committees dealing with bargaining and grievances.

The plan starts with the employee pledging his best efforts. In exchange, each worker gets a pledge pin. He is then eligible to qualify for additional pins, each indicating a more substantial contribution to production. The Management-Labor Committee makes the awards.

The names of those winning awards for production suggestions are inscribed on an honor roll displayed on bulletin boards, a citation for production excellence signed by War Production Board officials.

Promotion of the plan

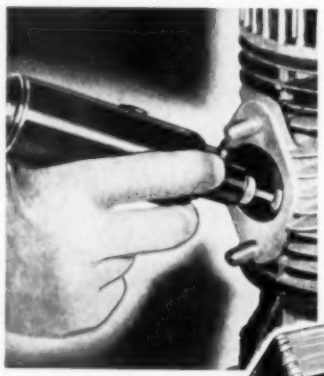
With the 100 percent cooperation of the union, the campaign to create harmonious relations between the company and its employees utilizes every enthusiasm-creating device known to the high-powered sales departments of the motor industry. Slogans and posters are hung throughout the office and factory weekly. Labor knows as much as management about the job.

In every plant division there is a "WORK TO WIN!" information booth. It serves as a clearing house for plan comment, aids employees in filling out their suggestions for shop betterment and answers questions about the program.

But possibly the most important of the results of "WORK TO WIN!" is the one which holds a promise. Both management and labor at Packard foresee a real contribution, through the plan's constructive influence, to the betterment of the industrial future when peacetime rather than wartime production will claim the interest of industrial workers. THE END.

DREMEL

MOTO-TOOLS
SPEED UP WAR PRODUCTION



Dremel Moto-Tools are speeding up war production in defense plants from coast to coast. These rugged tools tackle grinding, routing, buffing and finishing jobs with speed and precision . . . faster and easier, especially in close quarters . . . in hard-to-get-at places.

A Dremel Moto-Tool has a shock-proof bakelite housing, oil-sealed bearings, and a balanced armature to eliminate vibration and produce finer finished surfaces. It weighs only 13 ounces . . . can be hooked up to any AC or DC outlet. Used in America's leading arsenals of democracy . . . by General Electric, Westinghouse, Remington Arms, Ford, Nash-Kelvinator, Consolidated Aircraft, Northrop Aircraft, Douglas Aircraft, Inc., and many others.

Above: Moto-Tool is ideal for getting into close quarters, grinding, buffing and finishing to required specifications. Can be used for metal, wood, plastics, porcelain, glass, and other materials.

Below: Tool makers find Moto-Tool's sensitive, finger-tip control indispensable when shaping intricate or irregular metal dies. For grinding or cutting with steel accessories . . . it can't be beat for convenience and adaptability.

27,000 RPM.

The complete Moto-Tool kit has accessories for all types of grinding, buffing and finishing operations . . . with steel cutting tools and the best abrasives. Consists of 1 Model 2 Moto-Tool with 3 collets: 1/8", 3/32", and 1/16", 4 Emery Wheel Points, 1 Dressing Stone, 8 Carving Cutters, 1 Steel Saw, 3 Bristle Brushes, 1 Steel Cleaning Brush, 1 Screw Mandrel with Sanding Discs, and 1 Shoulder Mandrel, one 1/2" Drum Sander. Packed complete in sturdy felt-lined hardwood cabinet case $23.50. Dremel No. 2 Moto-Tool only $16.50.

Dremel emery wheel points, steel cutters and accessories with 1/8" shanks are available for quick delivery in a wide variety of sizes and shapes. They can be used with practically all makes of hand grinding tools. Write for catalog.

10 DAY TRIAL

Try a Dremel Moto-Tool for 10 days in your own shop. See how versatile, how indispensable it can become to fast, accurate work. Order from your industrial distributor, or contact any of the following representatives:

WEST COAST
THE FEDERATED SALES CO.
2437 West Valley Blvd.
Alhambra, Calif.

METROPOLITAN NEW YORK
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53 West Broadway
New York, N. Y.

NEW ENGLAND
F. W. FOWLER
116 Dartmouth St.
West Newton, Mass.

DREMEL MANUFACTURING CO., T443-A, RACINE, WIS.

SEEING .0001"

IS FASTER AND MORE POSITIVE THAN FEELING WITH "GO AND NO GO"

Use DIAL INDICATORS

ARMY E NAVY

All of us at Federal are proud to have conferred upon us the "E" for our achievement. We will continue to strive toward our common goal.

Precision with speed is of the utmost importance in all war production.

Conventional type Gages are too slow for today's tremendous war job. They also leave too much doubt in the hands of unskilled help.

Federal Dial Indicators and Gages are visual, hence fast and positive. They make multiple and simultaneous inspection practical. Ask about new Gage designs and catalog.

FEDERAL PRODUCTS CORPORATION
1144 EDDY STREET PROVIDENCE, R. I.

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PRECISION MEASURING INSTRUMENTS

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Photos by N. D. Jackman

Sightless, Arthur Schwenk works to .001 inch, equals the output of a "good" machinist in the Battle of Producion.

Arthur Schwenk, blind machinist, works 10 to 12 hours daily in his own shop turning out precision machine parts for war production.

Blind Machinist Cuts Blue Chips

ARTHUR SCHWENK of South Bend, Indiana, blind since early childhood, is spending 10 to 12 hours daily operating one of the nation's most remarkable war-time production enterprises.

In a small backyard shop, this 27-year old father is busily engaged turning out precision machine parts for one of his community's war industries.

"There is nothing so remarkable about adjusting and operating machinery without the use of eyes," says Schwenk, who built much of the equipment he uses. Schwenk's modesty does not permit him to tell the entire story of his accomplishments.

●

H. R. WENTZELL, member of the American Society of Tool Engineers, which has helped Schwenk carry on his war work, dramatizes this blind machinist's accomplishments thusly, "If you can't realize what it means when a blind man runs a machine shop, you should have been with me late one evening when I drifted into his shop. Everything was pitch-black. I could hear his lathe running. When I got him to turn on the lights, I found him boring and facing collars for milling machine arbors."

Schwenk, with the aid of his father, set up a small shop as a hobby. His equipment now includes a nine-inch motor driven South Bend screw cutting bench lathe, Ribbe and Grey Bench drill press, emery stand, arbor press, and a small adjustable stroke crank shaper. The latter, he built, using parts from a washing machine gear box and old cold rolled steel plates. Incorporated in the machine is an automatic down feed and trip switch to cut any depth keyway in a shaft. Motor shut-off is automatic at the bottom of the cut. Equipped with a hand cross feed for shaping flat work, it has adjustable stroke up to 12 inches.

Inventor of a Braille typewriter, Schwenk displayed unusual ingenuity in devising his own methods of measuring. He built a tool similar to a six inch pattern maker's clamp, with one jaw fixed and the other operated by a screw and small hand crank. To determine thickness or diameter, he counts the number of turns required to open the jaws until they will drop over the piece; then screws the jaws tight. He then subtracts the number of turns backward from the number required to open the jaws. The result is a measurement within 1/64-inch. A half-turn on the clamp thread equals 1/64-inch.

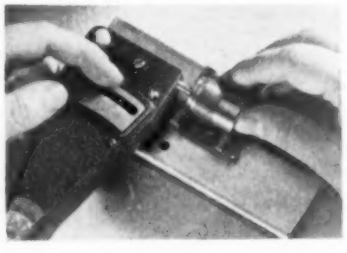
To measure thousandths, Schwenk has cut 25 vertical grooves around the barrel of a standard one inch micrometer. These are equally spaced, with the 25th groove deeper and wider. Mounted on the micrometer sleeve is a small bracket that carries a hardened V-shaped spring plunger fitting the grooves. When set at zero, the plunger rests in the deepest groove. After screwing the "mike" down until it slips into the work, he subtracts the number of notches from the number of turns and multiplies by 25. The result is the measurement within .001-inch. With his inside and outside calipers, Blind Machinist Schwenk can duplicate any piece of work.

●

THROUGH THE ASSISTANCE of A. S. T. E. members, Schwenk got spare time repetitive work for his home shop from Fred R. De Ferbracke's Defeco Mechanical Laboratories in South Bend. Soon he sold his newsstand and took on full-time work in his own shop. Friends supplied him with plug, step and adjustable snap gages and his work improved. He makes all his own set-ups and stops. With the aid of these gages and his own devices, he equals the production of "good" machinists and produces finishes that are often better.

"It makes me feel as though I had some part in helping to win the war," Art Schwenk says proudly. THE END

Comparator Gage for the Blind



● Recent development of a Braille type comparator inspection gage may make possible employment of thousands of blind workers in war production inspection jobs.

The instrument, which has the hearty endorsement of the National Society for the Blind, is known as the Micro-Chek and is built by Trico Products Corporation. In the Braille gage, indicators protrude through a slot and replaces a visual indicator which multiplies dimensions as much as 200 times. A finger touch reveals the movement and enables a blind inspector to determine whether the part will meet tolerance requirements. The Micro-Chek is furnished with various types of anvils for thread-gaging, thread-lead gaging and for internal dimensions.

Good tools occupy a key position in the manufacturing program of today. They can be properly designed only when the production processes and gaging operations are fully considered. Dimensional control is always an important function of the tool designer and should be an integral part of the design problem.

The Contract Work Division of Sheffield is composed of engineers who have had the broadest of experience in a very wide range of industries. They also have the advantage of a very close association with the manufacturer of gages and a true appreciation of gaging practice. When Sheffield engineers undertake a tooling program, they are prepared to carry it right from the first preliminary sketch through to final working drawings. The most economical sequence of manufacturing processes, handling, and gaging operations is stipulated.

SHEFFIELD GAGES
MASTER GAGEMAKERS

THE SHEFFIELD CORPORATION

DAYTON, OHIO, U. S. A.

If You Are TOOLING-UP for Some New Product, SHEFFIELD ENGINEERS Can Save You Much Valuable Time

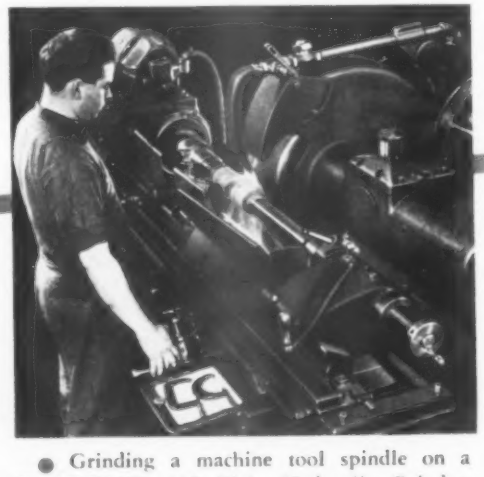
A Few Simple Precautions
WILL RETAIN NEW-MACHINE ACCURACY
In Your CINCINNATI Plain Hydraulic Grinder

● Depending upon the type, all machine tools have more or less of the quality "inherent accuracy and built-in skill". This new-machine excellence can be largely retained through the observance of a few elementary precautions; first, by the operator, and second, by his immediate supervisor. Here are the principal factors in retaining the wealth of new-machine accuracy and built-in skill in your CINCINNATI 10" Plain Hydraulic Grinding Machine:

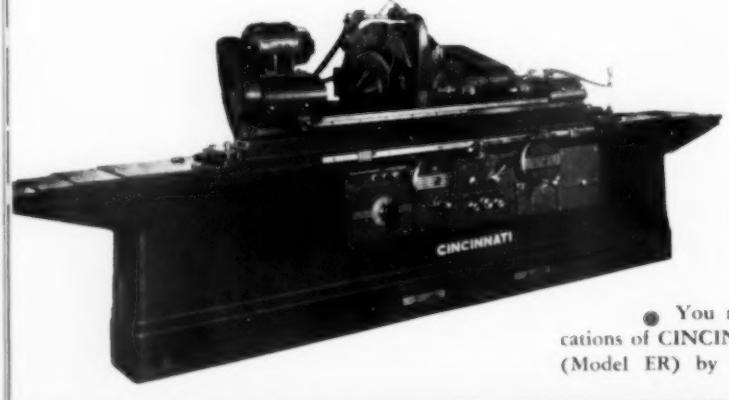
1. Keep machine leveled. Convenient screw adjustment is provided for this purpose.
2. Do not tamper with grinding wheel spindle bearing adjustment. Filmatic bearings will run for several years.
3. Use the right kind of oil, especially (a) for the grinding wheel spindle lubricating system (high grade light spindle oil, 100 to 130 seconds viscosity), (b) the hydraulic circuit (light turbine oil, 145 to 155 seconds viscosity), and (c) way lubricating system (E.P. base oil 290 to 320 seconds viscosity).
4. Replenish oil and clean filters periodically.

These steps are simple and easy to follow, aren't they? Through the observance of them, the machine will not only retain its original accuracy, but it will do so while *producing continuously.*

CINCINNATI



● Grinding a machine tool spindle on a CINCINNATI 10" Plain Hydraulic Grinder.



● You may obtain a description and complete specifications of CINCINNATI 10" Plain Hydraulic Grinding Machines (Model ER) by writing for specification catalog, No. G-490.

NCINNATI GRINDERS INCORPORATED CINCINN OHIO, U.

PRODUCTION PERSPECTIVES

T.M. REG. U.S. PAT. OFF.

LAST-MINUTE NEWS REVIEW OF MASS MANUFACTURING

War Production: November's gain of 12 percent was the greatest in volume since rearmament started. Rising output resulted from completion of new production facilities, improved plant utilization. Nelson says few factories have yet scheduled operations at more than half theoretical 168 hours. Though continued rise this year will be difficult to maintain, WPB wants production doubled. Control of scheduling by Nelson and manpower by McNutt should help in achieving this goal.

The Record: FDR's 1942 production goals, once considered fantastic, were largely met. By December 31, America's factories had poured out 49,000 planes; 32,000 tanks and self-propelled artillery; 17,000 anti-aircraft guns larger than 20 mm; 8,200,000 tons of merchant shipping; thousands of scout cars, track carriers, heavy guns, etc. Monthly U. S. output is now in excess of all Axis powers combined. Ernest Kanzler, WPB Director General, says the value of 1942 war output totaled 55 billion dollars...will total 7 billion in January—an annual rate of 84 billion dollars. Official goal set is 6 billion higher, with emphasis on shipping and heavy bombers.

Aircraft: WPB Vice-Chairman Wilson will center attention on aircraft, plans to double 1942 output. Last year's production exceeded that of previous 23 years. On a tonnage basis, it was 3 times as great. Utilization of mass production techniques is revealed in a 240 percent increase in engine manufacture on the basis of horsepower while manhours worked increased 155 percent.

Machine Tools: Marked rise in October production reflected completion of new plant facilities and industry drive to hasten output. Gain was 8.3 percent. September increase was only 2.4 percent. Volume reached an all-time peak of $130,000,000 compared with $120,000,000 in September. U. S. total for 1942 is estimated at 350,000 units valued at $1,400,000,000, almost double the previous year's production. Unfilled orders will require 7.5 months to complete, a 1.5 month cut since summer. Reduction reflects decline in new orders and increase in production. WPB will warn some of the 80 war-born machine tool plants to look for other war work. Same goes for about 100 concerns making machines under names of established firms.

Scrap: Best answer in the 'scrap it or use it' wrangle between Washington and Detroit comes from Packard Motor President George Christopher. The huge special-purpose auto-industry tools, now in grease, are 85 percent grey iron, he says. Grey iron is not scarce. Scrapping them will double and triple length of post-war unemployment during retooling. Eighty-five percent of auto-industry tools are now on war work.

Manpower: Government's plea for more women in factories is no cry of wolf. This year, the Colonel's Lady will really toil beside Judy O'Grady. About 30 percent of the total war industry labor force of 20,000,000 will be feminine. Engineers training workers last year will have a real headache in 1943. McNutt says 18,000,000 Americans must change jobs before next January; 13,500,000 of whom must be trained for industrial work. Job freezing in Detroit area is a prelude to nation-wide labor conscription if employers, workers and unions fail to cooperate in manpower problem. Loss of production time through strikes is decreasing. Man-days lost in war plants in October were 325,000. Though the War Manpower Commission has declared an absenteeism of 2 to 3 percent normal, a recent survey in a vital production center showed a 6.6 percent average on any day. Reasons deduced: Strain of 45.7-hour average work week in industry today; high overtime rates kill incentive to stay on the job. Watch for a law requiring overtime payment in war bonds.

Industrial News Digest...

A review of significant developments and new techniques in mass production industries.

Nashville site of assembly-line aircraft production job

● MASS PRODUCTION of aircraft has been a reality for a year in Nashville, Tennessee, where Vultee Aircraft Inc., is turning out a new Army dive bomber. Known in the U. S. as the A-31 and called the Vengance by the British, the ship is believed to surpass the German "Stuka." It is powered by a 1,600 H. P. Wright "Double" Cyclone engine.

Rapid production on this heavily armored plane is maintained on a completely mechanized overhead conveyor line. Said to be the only one of its kind in the industry, this line permits workers to cover almost all phases of final assembly while standing on the floor in comfortable and efficient working positions. Progressive stages of assembly are accomplished as the conveyor moves along the line until the completed plane rolls out ready for flight testing.

Maine yards launch ships nearly complete, Tool Engineers told

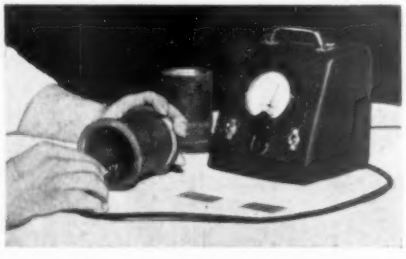
● UNLIKE SHIPS BUILT by west coast yards, especially those of the Kaiser organization, Liberty-type vessels launched in Maine's new South Portland and Thompson's Point shipyards are 95 per cent complete when they slide down the ways. This fact was claimed by Ensign Harold A. Miller, Superintendent of Police for these New England yards in addressing a recent meeting of Tool Engineers at Portland, Maine.

Construction of the yards started on May 9, 1941; one year and six days later the first ship was launched. During that time 25 acres had to be filled to a depth of 15 feet with 500,000, cubic yards of gravel; electric, water and sewage systems had to be installed; piles for buildings, ways and piers had to be driven, some during the winter. While all this construction was going on, men were laying the keels and fabricating the ships on the ways, even in the midst of swirling snow. Personnel of the yards now numbers more than 13,000.

"When the yard was first erected," Ensign Miller said, "we racked what steel we had at the head of the ways. Now we rack our steel on new property and the space at the head of the ways is being used for fabricated sections." Within five hours after a ship has gone down the ways, a new keel is laid, innerbottoms are started in place and the first plates are on their way to position, he added.

In moving heavy steel parts, the South Portland yard operates 14 overhead cranes from five to 10 tons each, and 11 gantry cranes of 25 tons capacity. In the early days, according to Miller, everything had to be handled by hand or truck cranes. When the first ships were built, they were assembled piece by piece on the ways.

Portable electric gages speed machined parts production



Measuring the thickness of an aircraft bearing surface.

● PORTABLE ELECTRIC GAGES which speedily check the thickness of surface coatings of precision-machined parts are helping to speed war production. After the war, industry in general can be expected to adopt them extensively, according to H. P. Kuehni, gage expert of the General Electric Company.

To prevent corrosion and to increase wearing qualities, steel bearings going into plane and tank engines are lined with lead-bronze, copper, silver or heavy babbitt while other steel parts are plated with chrome, nickel or cadmium. The thickness of lining or plating must be accurate to a thousandths of an inch. Formerly, such parts were checked by selecting a few as they came off the assembly line and cutting them open for measurement by microscope. In another method, wall thickness was measured before and after the lining was removed, the difference between the two measurements representing the thickness of the lining.

The portable electric gage measures the thickness of lining or plating without marring, thereby saving time and materials. A small cylindrical gage head containing an electro-magnet is connected to a main indicating unit by a light-weight cable. The gage can measure the thickness of any nonmagnetic layer up to 0.3 of an inch thick backed by steel. The instrument indicates thickness on a dial gage large enough to be read at production line speed. This gage, developed originally to measure glass, or mica, provided they are placed on steel tables or otherwise backed by steel at the point of measurement.

Another gage has been developed for measuring the thickness of nonmagnetic metal sheets and plates such as aluminum, copper, brass and bronze. This gage is used to check wall thickness of magnesium and aluminum alloy castings rolling off assembly lines in mass quantities. No steel backing is necessary.

Severance forms new tool firm; New plant opened

● FORMATION of a new corporation, Severance Tool, Inc., to take over the operations of all Severance Tool Company service branches has been announced.

The new corporation will have facilities in all its plants, to handle regrinding, sales and service operations on Severance "Midget Milling Cutters", and other high speed steel cutting tools designed by R. M. Severance. A new plant is being opened at Springfield, Missouri. Main offices are in Saginaw, Mich.

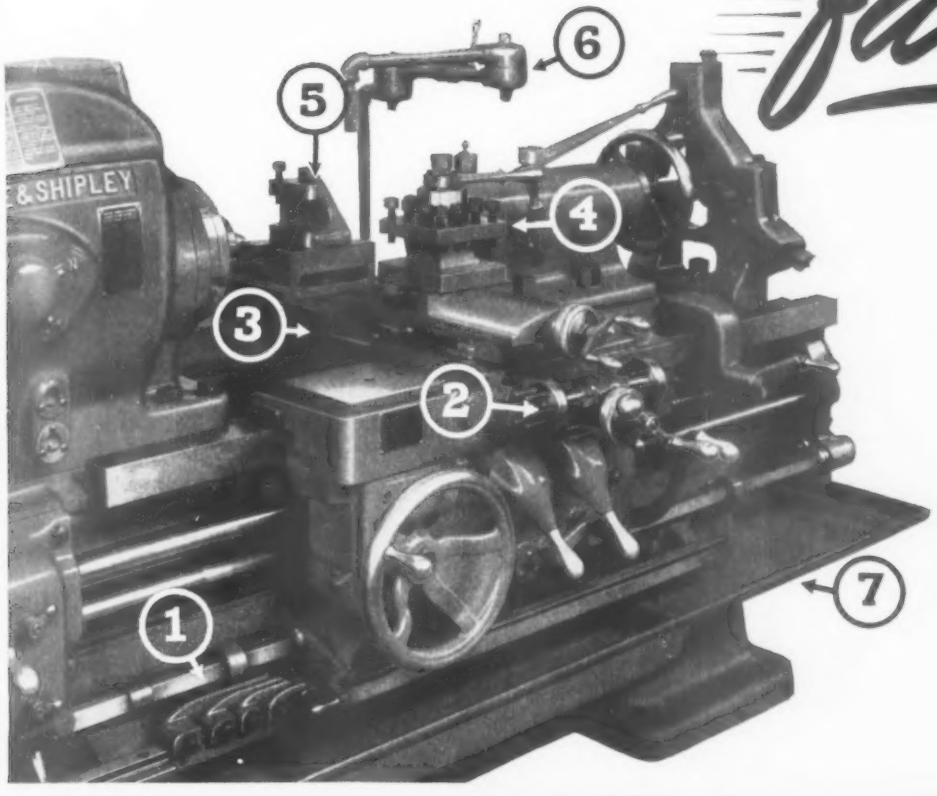
Aluminum forging industry now 25 times its size in 1938

● THE ALUMINUM COMPANY OF AMERICA'S production of forgings is now 25 times that in 1938, the company states.

As many as 150 types of aluminum forgings are used in a single fighter plane, while bombers may have as many as 300 types. Outstanding among these are propeller blades.

(Continued on page 112)

Produce SMALL Lots *faster*



Awarded Navy "E"
March 6, 1942

Why you save time with The Lodge & Shipley Manufacturing Lathe

Change over quickly and easily from one job to another.
Advantageous use of multiple tools and universal holders.
Transfer of diameter and length control from operator to lathe.

OUTSTANDING FEATURES

(1) Multiple Length stops (Telescopic Dog Type), automatically disengage longitudinal feeds.

(2) Multiple Diameter Stops, for both front and rear tools, can be quickly indexed for establishing diameters. Time wasting "cut and try" eliminated.

(3) Connected rear rest increases tooling possibilities. Adaptable to single or multiple tools.

(4) Four-way tool block on compound rest can be indexed for twelve equally spaced tool positions.

(5) High duty tool block in rear used for single tool can be supplemented or replaced with multiple holder.

(6) Coolant pump and piping.

(7) Chip pan.

WRITE FOR PUBLICATION No. 482

THE LODGE & SHIPLEY MACHINE TOOL CO.

CINCINNATI, OHIO, U.S.A.

ENGINE TOOL ROOM AUTOMATIC LATHES

(Continued from page 110)

Aluminum used in making these forgings contains alloys of copper, silicon, and manganese. In the form of ingots, the metal is cut, rolled into bars, smoothed by a process known as "scalping", and cut to blade-size lengths.

The bars are then heated and placed in dies. Big 35,000 pound hammers, the largest commercially obtainable, pound the bars into propeller blade shape. After rough edges have been trimmed, the blades are heat-treated to attain maximum strength and hardness. The blades are minutely inspected and checked before delivery to aircraft propeller plants where they are machined, ground and polished and mounted in hubs.

Pointing to the growth of aluminum forgings as an industry, the Aluminum Company says that as recently as 1939, forging output represented only about one and one-half percent of new aluminum production. In addition to propeller blades, Alcoa makes forgings for pistons, crankcases, and thousands of warplane fittings.

Oster celebrates half century in Business

● THE OSTER MFG. CO. of Cleveland, manufacturers of pipe and bolt threading equipment and turret lathes is this year celebrating its 50th anniversary.

Founded by the late Herman W. Oster and Russel B. Tewksbury, the company started operations in a one story work shop which soon grew into a modern, well equipped plant. This has expanded again and again. In 1929, a merger was effected with the Williams Tool Corp., giving Oster additional plants, one in Erie, Penna., the other in Brantford, Ont., Canada.

Today, the concern's entire production is going to the armed services and others engaged in the war effort. Roger Tewksbury, succeeding his father, R. B. Tewksbury, is president and treasurer. Arthur S. Gould is vice president, and Harry A. Maurer, long associated with Oster as general superintendent, is secretary.

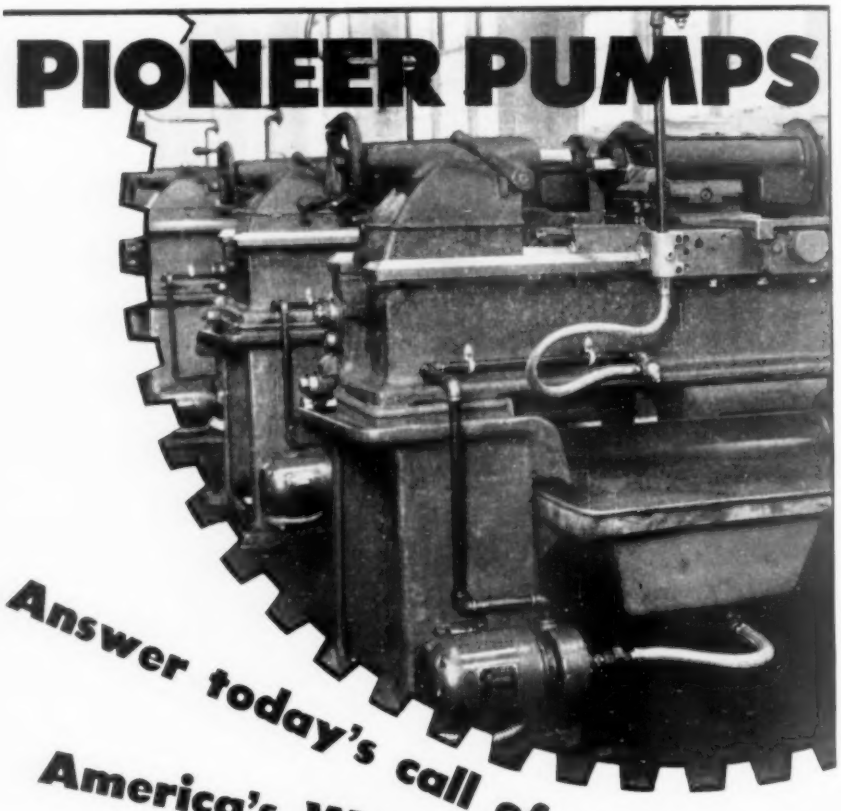
P and W Aircraft and Licensees in war-born industrial cooperative

● TO INCREASE PRODUCTION of power plants for United Nations' airplanes, the Pratt and Whitney Aircraft division of United Aircraft Corp. and six licensees (Ford, Buick, Chevrolet, Nash-Kelvinator, Jacobs and Continental) have been shuttling back and forth the "know-how," men, machines and materials.

Even before agreements were signed, licensee engineers and production men were flocking to the East Hartford plant to learn the special techniques used in quantity production of the "Wasp" series of engines. Pratt and Whitney experts, besides assisting them there, also answered distress calls at the licensee plants.

Single parts were supplied for samples. Tools were loaned — machine tools weighing as much as five tons were pulled out of the production line in East Hartford and trucked to the mid-west when tool makers were unable to make delivery to the licensee on time. The only restriction on aid was that it should not delay production in the main plant.

(Continued on page 114)



Answer today's call of America's War Production

Because the Pioneer Pump is able to handle fluid containing solids, chips, and dirt; and because its pressures are greater, this pump is selected in the leading plants doing war work.

The absence of a gland and the perfect sealing of the liquid from the bearings reduce both maintenance and power consumption—both important factors today.

The range of models embraces applications to suit every condition that may be met—from large capacity pumps to small compact units for limited spaces.

PIONEER PUMP

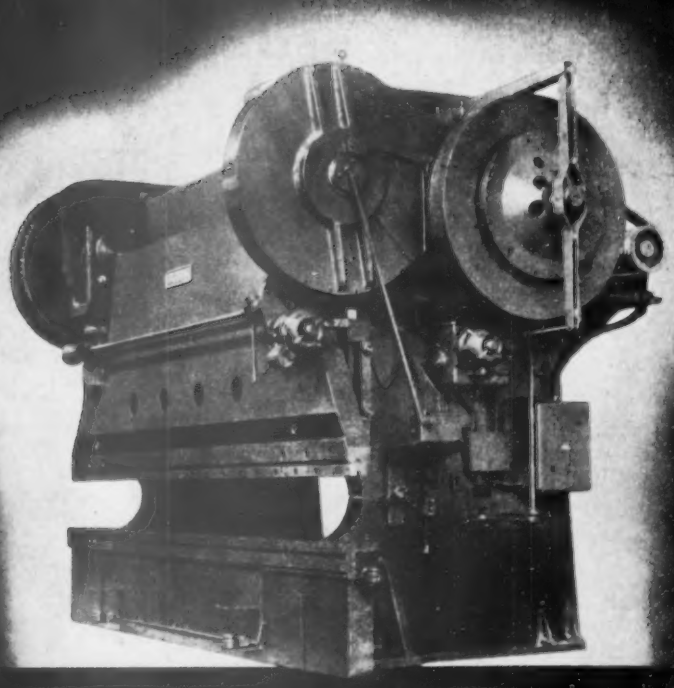
AND MANUFACTURING CO.

19645 JOHN R. • DETROIT, MICH.

ARMOR PLATE

. . . Shear it on Cincinnati Shears
. . . Straighten it on Cincinnati Brakes

Write for recommendations based on our twenty years' experience in building Cincinnati Steel Press Brakes and Cincinnati All-Steel Shears for arsenals, navy yards, and manufacturers of armament.



THE CINCINNATI SHAPER COMPANY, CINCINNATI, OHIO

SHAPERS · SHEARS · BRAKES

(Continued from page 112)

While the new contractors were getting started, Pratt and Whitney diverted them more than $500,000 worth of engine parts from its own supply. The procedure has since been reversed with the licensees sending in parts when shortages exist at the home plant. Likewise, improvements in production techniques have been freely shown Pratt and Whitney engineers, and, where feasible, have been put into operation at Hartford.

St. Louis engineers pool resources for Ordnance

● PART OF A SYSTEM of industrial committees organized by Major General Levin H. Campbell, Chief of Ordnance, 16 St. Louis production experts are pooling their collective experience at a weekly meeting to obtain maximum production in a minimum of time.

Exchanging ideas which in peacetime would be guarded by patents, these peacetime competitors reveal everything they have learned to facilitate war production. This Production Advisory Committee was organized late last year when shortages of machine tools and materials posed a production bottleneck.

Lt.-Colonel E. H. Sager, head of the Ordnance Department's manufacturing Service, and Lt. H. W. Hempel, Contact Officer represent the government at the meetings. Other members are: Cal Stephens, Robert R. Stephens Machinery Co., Inc.; G. Eichelsback, Jr., American Stove Co.; Ernest Dunford, Landis Machine Co.; Jonathan Kludt, Lincoln Engineering Co.; Arthur Nuetzel, Blackman - Nuetzel Machine Co.; R. Laffler, Pratt and Whitney Co.; Hal Knight, W. B. Knight Machinery Co.; Henry Miller and F. G. Sachloben, Emerson Electric Mfg. Co.; O. W. Johanning, Colcord-Wright Co.; and E. C. Meinholtz, Missouri Pacific Railroad. Twelve of these men are members of the local chapter of the American Society of Tool Engineers.

Delays in production resulting from lack of materials or parts are reported to have been drastically decreased as a result of this pooling of resources.

Detroit sets production records; Hudson turns out marine engine

● TWELVE MONTHS AGO the auto industry became a department of the United Nation's arsenal. Since then, this industrial machine has witnessed the most amazing transformation in the history of the machine age. Its output of war goods is today somewhere between one-sixth and one-fourth of the total U. S. war production. In the first six months, almost a quarter million machines were listed in 442 plants of 259 companies. Moved from place to place, 86 percent of these machines today are fully employed on war work — in and outside the industry.

Aircraft; tanks, military transport; cannon, shells and related fully assembled armaments and parts produced by automotive companies amounted to $4,665,000,000 last year, more than 10 percent above the value of the industry's peacetime peak output. Detroit arms output last month totaled $575,000,000, which is an annual rate of $7,000,000,000. This figure

(Continued on page 116)

Now more than ever you need this help for TRAINING Tool and Die Makers

Widely used by many companies and trade schools throughout the U. S., it meets urgent need for a complete, up-to-date text for training new men, "refreshing" older men, or trouble shooting in the tool room. The shortage of tool and die makers must be met fast by men who know the "whys" and "hows." This book gives them both and more. It shows how to select tool steel; how to make tools; how to avoid trouble; how to improve tool performance. Read below what others say about this modern text.

OVER 35,500 COPIES IN USE

TOOL STEEL SIMPLIFIED

By FRANK R. PALMER
Vice-President of
The Carpenter Steel Company
315 pages — 205 illustrations

$1.00 postpaid in U. S. A. **Elsewhere $3.50**

Low price of $1.00 per copy makes it economical for training use. Elementary enough to meet the urgent need for a good text for apprentice training. Practical enough to be helpful in advancing the skilled tool maker. Contains hundreds of practical suggestions that can be quickly applied in daily work to get improved tool performance. Send coupon below for a copy of "Tool Steel Simplified."

Read What Others Say:

. . . Consider it one of the very finest books that our local schools of vocational and adult education might use in training of apprentices in machine trades.

R. L. Welch
Supervisor Industrial Education
State of Wisconsin

. . . Simple and easy to read. Contains useful information which commends it to technical men, semi-technical men, and men in the shops who want to improve their ability to make the best use of tools.
Prof. Bradley Stoughton
Dept. of Metallurgical Engineering
Lehigh University

. . . Valuable textbook for apprentices and journeymen, and an equally valuable handbook for tool designers and others concerned with the use of tool steel.

J. B. Chalmers
Director of Training
The Yale & Towne Mfg. Co.

. . . have read and re-read the book. Became absorbed in finding out and learning so many things I never knew before. Chapter 17 on quenching is worth the price of the book . . . will need 45 copies for classroom use.

F. E. Laverty
Worcester Boys' Trade School
Worcester, Mass.

SEND Now

The Carpenter Steel Company
Reading, Pa. Dept. 4L

Please send me postpaid your convenient handbook, "Tool Steel Simplified". I enclose $1.00 ($3.50 outside the U. S. A.) in full payment.

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The Challenge of the Present... and the Promise of the Future!

THESE are challenging days in which to live and work—and America has met the challenge. Week by week, the people of this country are proving that they can make sacrifices and ignore discomforts. And industry has met the challenge by pooling its knowledge and resources, developing new techniques and materials, and creating a vast new reservoir of supply.

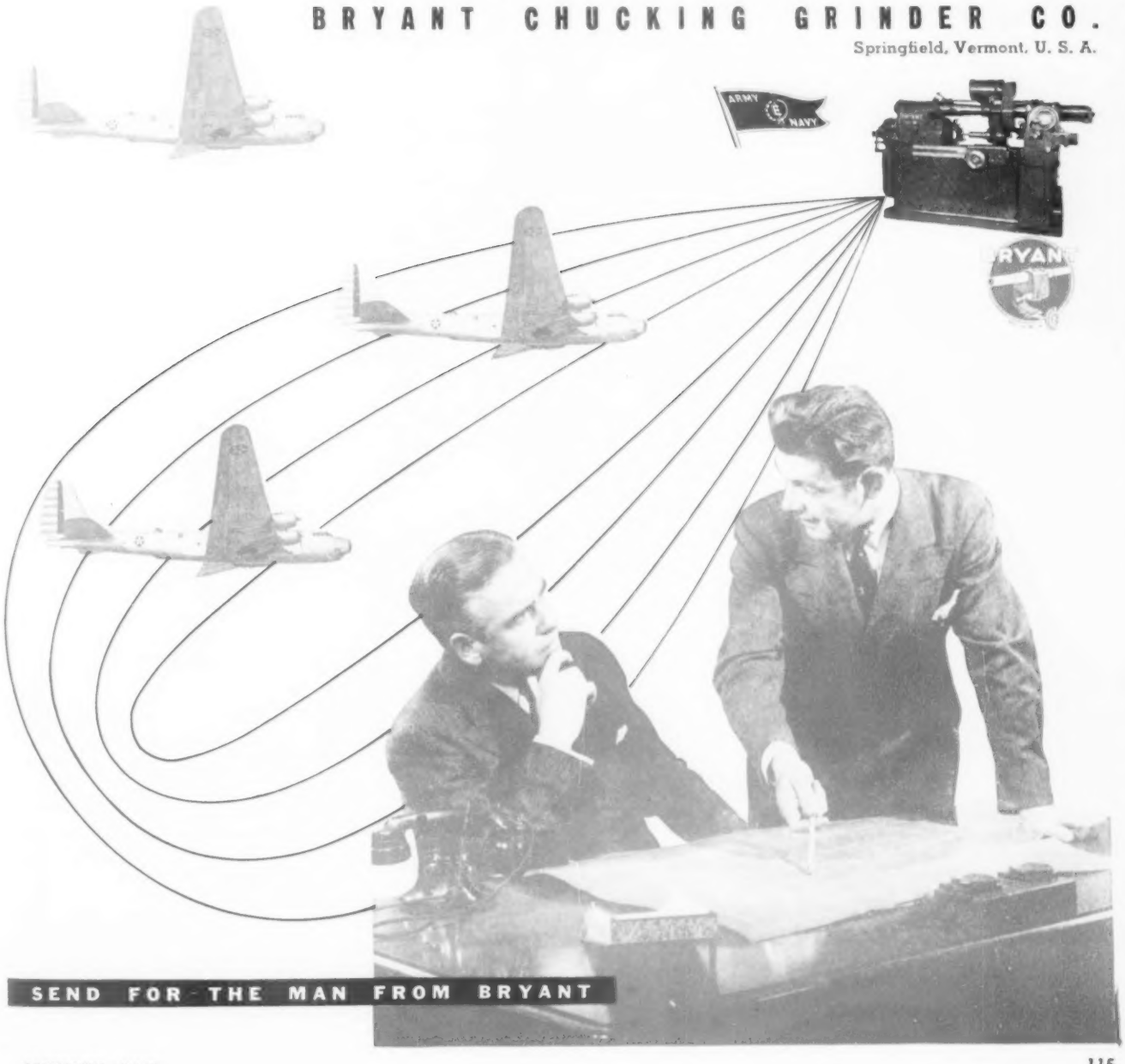
The result of all this is a great new market of the future: A growing demand for millions of war-restricted articles—new, improved products for post-war competition—a backlog of savings created by war bonds and curtailed buying. . . . The result, say many of America's foremost analysts, is *post-war prosperity!*

If you are to be prepared for a quick transition from armament to peacetime business, *now* is the time to study your tooling problems—and in this we can help you. For Bryant engineers are among the foremost authorities in the specialized field of internal grinding . . . and today, with their major war production problems solved, they are once more ready to help you.

Write now and give them full information on your internal grinding problems.

BRYANT CHUCKING GRINDER CO.

Springfield, Vermont, U. S. A.



SEND FOR THE MAN FROM BRYANT

(Continued from page 114)

would be the equivalent to producing 10,000,000 cars and trucks. Greatest number of such units produced in a single year was 5,358,420 in 1929.

Last month witnessed the freezing of labor in the Detroit area, center of the industry's manpower problem. In December there were 960,000 workers on auto plant payrolls, 26 percent above the pre-war record high of May 1941. Relative size of the industry's war production jobs is indicated in a breakdown of the $14,000,000,000 in orders on its books this month. Nearly 50 percent is in the aircraft classification; 20 percent is for completed planes, airframes and assemblies; nearly 25 percent is for aircraft engines, and five percent is for propellers and miscellaneous parts.

* * *

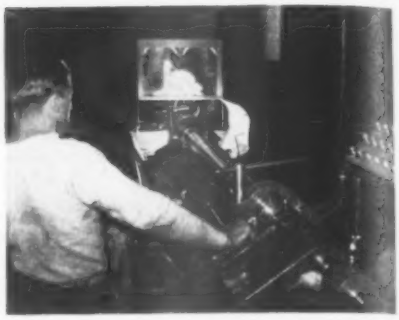
Interesting 'production' news out of Detroit includes the fact that Ford's famed Highland Park plant, partly converted to tank assembly, is now pouring out the all-welded 32-ton M-4. Carrying armor plate made at River Rouge and constructed almost wholly from materials manufactured in the company's plants, this unit embodies numerous innovations that engineers at Dearborn say contribute to faster mass production. One is increased accessibility of vital parts. The Ford-built engine can be lifted out for replacement or repair with ease. The gun mount, previously made of 27 fabricated parts, is now turned out in three castings, with time reduced by two-thirds.

At the over-publicized Willow Run plant, bombers are now rolling from both of the final assembly lines, and sub-assemblies are being shipped to mid-western assembly plants. Evidence that these automen are gaining the aviation 'know-how' is the fact that last month construction time on the vital center wing section of the giant B-24 was cut by 53.5 hours. This wing section supports four engines.

In another of this concern's plants in the Detroit area, manufacture of anti-aircraft gun directors is now under way. Possibly the finest precision instrument mass-produced, tolerances are held to .001 of an inch. More than 2,000 girls are at work on the job. Determining the accuracy of work performed are women just out of college, some having Master's degrees in mathematics. Rooms in which the fine gears are finished are completely air-conditioned, and no girl may wear nail polish or long hair. A small strand of the finest hair, meshed in the instrument's gears, will

(Continued on page 119)

MIRROR SPEEDS GRINDING



By watching the reflection in a dime store mirror, this Pontiac Motor machinist is able to tend his grinder and at the same time observe its action on the end of the anti-aircraft cannon barrel.

a complete line of *Permanently Accurate*

Torque Wrenches

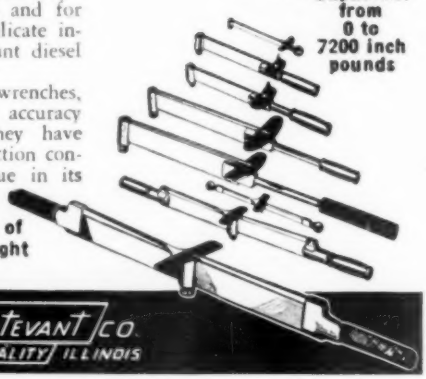
STURTEVANT

NO FRICTION ADJUSTMENTS MOVING PARTS FRAGILE MECHANISMS

Torque Wrenches are used in leading industrial, automotive and aircraft plants to control the set of screws and nuts in production departments . . . to measure and test applied torque or resistance in laboratories and inspection departments — and for innumerable jobs ranging from building delicate instruments to checking frictional drag in giant diesel motors.

Built by the pioneer in accurate gauging wrenches, they are more accurate. They retain their accuracy permanently. Practically indestructible. They have brought to industry a new means for production control and for gauging and measuring torque in its thousands of applications.

Capacities from 0 to 7200 inch pounds

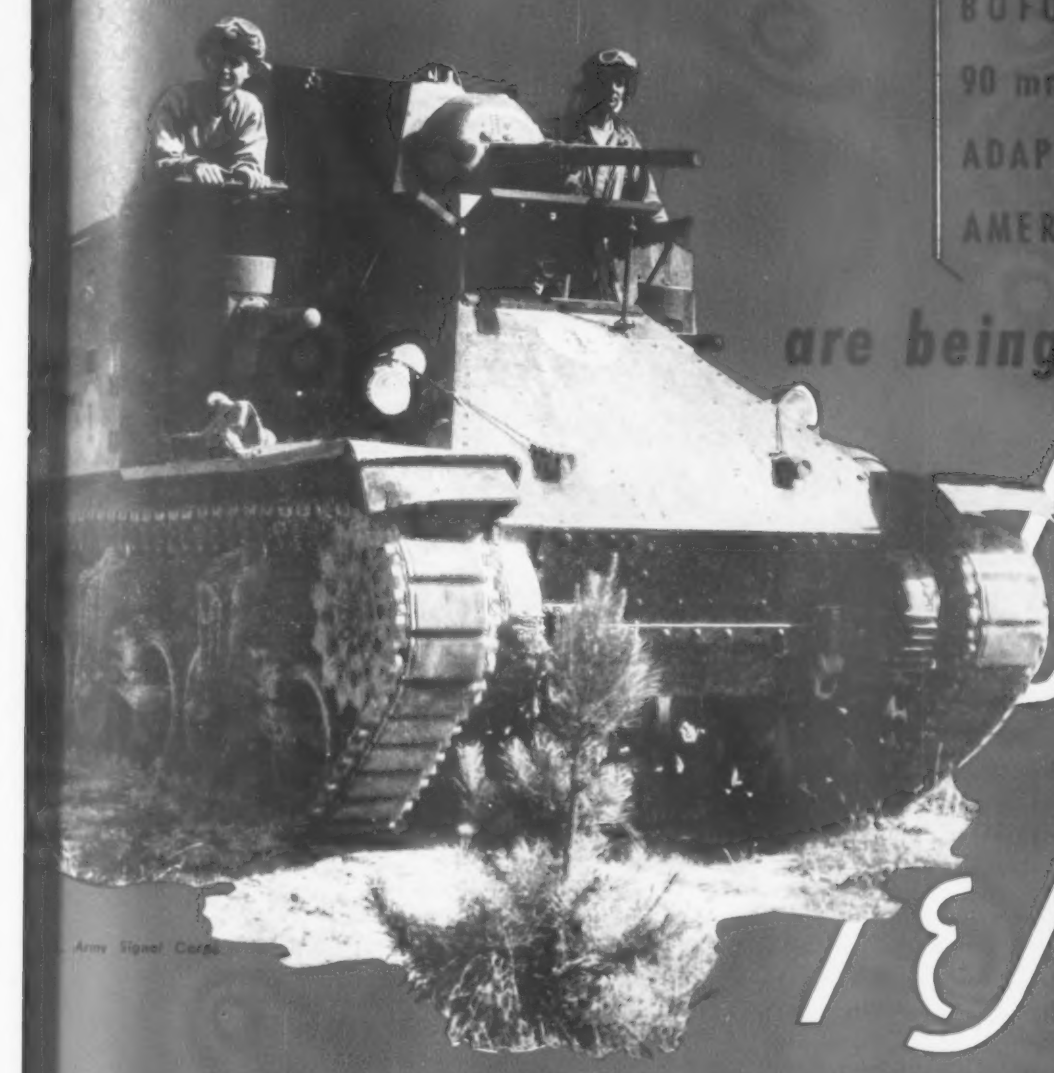


Write for Bulletin describing use of STURTEVANT Wrenches at Wright Aeronautical Co.

P A STURTEVANT CO.
ADDISON QUALITY ILLINOIS

Duplicate parts for

- AIRPLANES
- AIRPLANE ENGINES
- TANKS
- BOFORS GUNS
- 90 mm. ANTI-AIRCRAFT GUN
- ADAPTORS FOR SHELLS
- AMERICAN OERLIKON GUN



Army Signal Corps

are being produced on

AUTOMATIC CHUCKING EQUIPMENT

in the Arsenals of Democracy

Full speed ahead—the order of the day—is an obligation and a responsibility resting squarely on the shoulders of metal working plants.

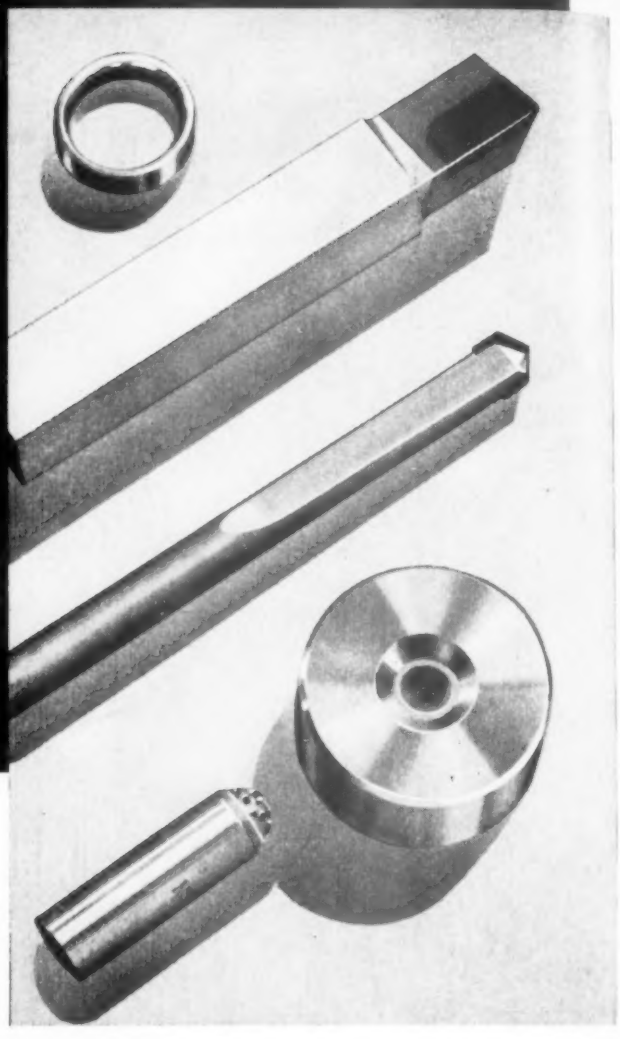
Potter & Johnston Chucking Equipment is helping these plants meet the difficult schedules which are involved in the production of urgent war needs. Demands for increased production have brought many opportunities to the attention of P&J engineers. Long experience and versatility of tooling have made it possible for P&J to render invaluable assistance.

Potter & Johnston is glad to be able to do so much to help speed the Allied war effort.

The POTTER & JOHNSTON MACHINE CO.

MILWAUKEE — PROVIDENCE, RHODE ISLAND

Use all 5 Ways to STEP UP War Production . . . With Carbides



1. Cut Metals Faster! . . . Carbide tools commonly double the volume of metal removed per hour. Cut wide range of material, from "tough" armor plate to "soft" plastics. Continuous or interrupted cuts. Adaptable to most old machines, as well as new. (Catalog GT-142.)

2. Dress Grinding Wheels Easier! . . . Diamond-Impregnated Carboloy dressers make diamonds do a full day's work every day! No time out for remounting. No lost diamonds. No "pampering" temperamental stones. Diamonds held permanently in place. Stocked in 3 sizes for wheels up to 42" diameter. (Catalog GT-142.)

3. Keep Machines Running! . . . Stop "shut-downs" caused by excessive wear on such parts as rollers, cams, guides, gages, valves, etc., used on your equipment. Just a small insert of carbide at the point of wear often increases life of parts up to 100 times longer. (Booklet WR-101.)

4. Draw Metals Better! . . . Draw, size, extrude your metals through carbide dies for better finish, greater accuracy, larger output, more continuous operation. Use for wire, bar, tubing, sheet metal. Outstanding for cartridge cases from .30 cal. through 105 mm. (Manual D-113.)

5. Install Equipment Quicker! . . . When installing new equipment, wiring and piping, or relocating present machines, carbide masonry drills drill holes 75% faster in concrete, brick, tile, porcelain, plaster. (Leaflet GT-103.)

CARBOLOY COMPANY, INC., 11145 E. 8 Mile Blvd., Detroit, Mich.

(Sole makers of the Carboloy brand of cemented carbides)

Chicago • Cleveland • Los Angeles • Newark • Philadelphia • Pittsburgh • Seattle

Canadian Distributor: Canadian General Electric Co., Ltd., Toronto, Canada

CARBOLOY CEMENTED CARBIDES

TRADEMARK

TRADEMARK

TOOLS • DIES • DRESSERS • CORE BITS • MASONRY DRILLS • WEAR RESISTANT PARTS

(Continued from page 110)

throw it out of adjustment.

* * *

A new production job at Detroit is the Hudson Motor Car Company's manufacture of engines used to propel invasion barges. Inasmuch as the designing of tools, dies, jigs and fixtures for the contract began in June, conversion of the plant to this big engine is considered a remarkably fast job. It called for more than 4,600 special tools, gages, jigs and fixtures, not including many dies. All of the tools had to be made especially for this contract, and 700 machines were converted. The dynamometer used in testing the engine is a water-pressure device by which loads up to and exceeding the capacity of the engine can be exerted to test performance. Hudson engineers take pride in the smooth performance of the engine in view of its difference in size and design from automobile power plants, and that the marine engines are being turned out almost entirely with converted automobile machinery which they prepared for this project.

ARMY - NAVY "E" AWARD WINNERS

CHICASAW ORDNANCE WORKS
E. I. duPont de Nemours & Company, Inc.
Millington, Tennessee
CONSOLIDATED AIRCRAFT CORP.
Plants 1 and 2, San Diego, California
ROGERS DIESEL AND AIRCRAFT CORP.
Edwards Division, Sanford, North Carolina
FEDERAL PRODUCTS CORP.
Providence, Rhode Island
HAINES GAUGE COMPANY
Philadelphia, Pennsylvania
H. M. HARPER COMPANY
Chicago, Illinois
JESSOP STEEL COMPANY
Washington, Pennsylvania
KANKAKEE ORDNANCE WORKS
E. I. duPont de Nemours and Company, Inc.
Joliet, Illinois
LEMPCO PRODUCTS, INC.
Bedford, Ohio
LODGE AND SHIPLEY MACHINE TOOL CO.
Cincinnati, Ohio (Star added)
REDSTONE ORDNANCE PLANT
Huntsville, Alabama
STANDARD GAGE COMPANY, INC.
Poughkeepsie, New York
UNITED WIRE AND SUPPLY CORP.
Providence, Rhode Island
WELDON SPRING ORDNANCE WORKS
Atlas Powder Company, Weldon Springs, Mo.

MARITIME "M" AWARD WINNERS

COOPER - BESSEMER
Mount Vernon, Ohio and Grove City, Pa.
DAVIS ENGINEERING CORP.
Elizabeth, New Jersey
HOMESTEAD VALVE MANUFACTURING CO.
Coraopolis, Pennsylvania
M. W. KELLOGG COMPANY
Jersey City, New Jersey
LINDE AIR PRODUCTS COMPANY
East Chicago, Indiana
NATIONAL SUPPLY COMPANY
Springfield, Ohio
PRODUCTION ENGINEERING COMPANY
Berkeley, California
RUSSELL AND ERWIN MANUFACTURING CO.
New Britain, Connecticut
TUBE - TURNS, INC.
Louisville, Kentucky
WHITIN MACHINE WORKS
Whitinsville, Massachusetts
YOUNG IRON WORKS
Seattle, Washington

Consolidated Aircraft to build small plants near labor supply

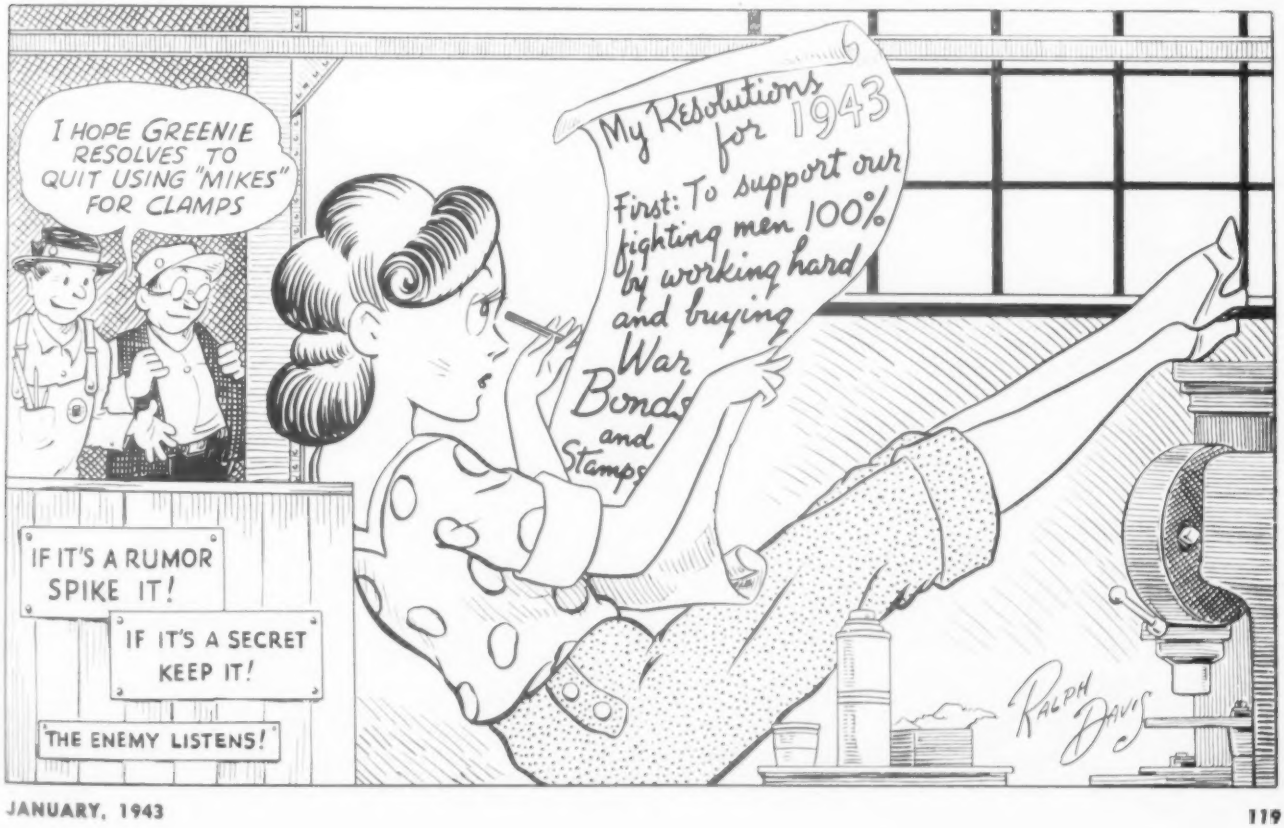
• IN AN ORIGINAL MOVE to alleviate the manpower problem by taking production to available labor, Consolidated Aircraft Corp. is planning to open small parts plants in 12 California communities.

Opening of plants in communities where labor is available and distances are not too great to create a transportation problem marks the first time a

(Continued on next page)

"GREENIE" T.M. REG. U.S. PAT. OFF.

Stick to It, Greenie!


I HOPE GREENIE RESOLVES TO QUIT USING "MIKES" FOR CLAMPS
My Resolutions for 1943
First: To support our fighting men 100% by working hard and buying War Bonds and Stamps
IF IT'S A RUMOR SPIKE IT!
IF IT'S A SECRET KEEP IT!
THE ENEMY LISTENS!
RALPH DAVIS

(Continued from preceding page)

prime contractor in the war program is believed to have set up its own subcontracting plants to speed production. The concern says that it will lease space in small towns, and will send in experienced production men to train new personnel and manage the shops.

Ordnance Department gives special tool jobs to small shops

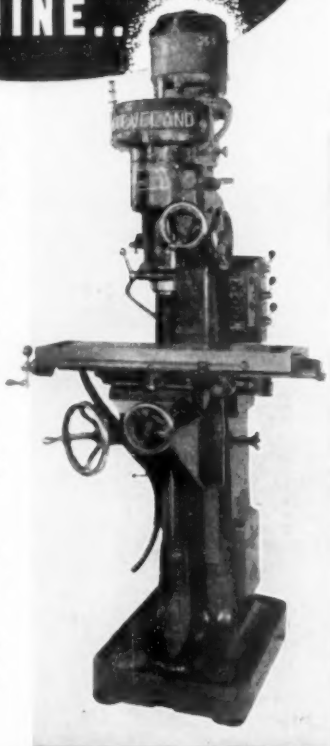
• To utilize the facilities of more than a thousand small plants throughout the country not on war production, the Ordnance Department Tank Automotive Center, Detroit, is now engaged in a program to convert them to the manufacture of special maintenance tools for combat vehicles.

More than 200 small machine shops in Eastern states are now participating in this program. More than 300 others will be converted to this work within the next 90 days, it is expected. The Army reports that only minor adjustments were necessary in most of these plants to undertake this type of work. Study of facilities available made it possible to assign to each manufacturer the tools he was best fitted to make with a minimum of change in shop set-up.

None of these special maintenance tools are standard products of the tool industry. Even though it was not possible for some small plants to produce the entire tool, or set of tools, arrangements have been made to subcontract a portion of the prime contract so that all may participate. This move is interesting in light of the recent transference of the wood cargo body building program from several major automobile companies to more than 1,000 small plants.

DESIGNED TO FILL AN *Expressed* NEED –

THE *Cleveland* NO. 1 VERTICAL MILLING MACHINE..



The wide welcome it has received shows that the Cleveland No. 1 Vertical Milling Machine has indeed filled a definite need. Modern production plants, tool rooms, and mold shops evidently wanted these features:

(1) Big, husky spindle of chrome nickel steel heat-treated and mounted on 200-lb. preloaded precision bearings.
(2) All lead screws and feed gears mounted on Timken bearings for smooth, quiet running and longer life.
(3) Overload protection on all motors to prevent motor failure and resultant production breaks.
(4) Ample coolant sump in base. (Pump optional.)
(5) Hand wheel and lead screw on spindle head for quick shifting of belts for changes of spindle speeds.
(6) 12 feeds and 12 speeds to broaden range.

Longitudinal feed, 18"; cross travel, 8-1/2"; vertical travel, 16". Table working surface, 8" x 32". Cutter capacity, 1/16" to 2-1/2" mills. Spindle speed, 100 r.p.m. to 1800 r.p.m.

The "Cleveland No. 1" gives you great speed and power, combined with strength, rigidity and accuracy. It excels on continuous heavy duty production.

Ask for Sommer & Adams Bulletin "E"

THE SOMMER & ADAMS COMPANY
18511 EUCLID AVENUE • CLEVELAND, OHIO
Custom-Built EQUIPMENT FOR MANY PURPOSES

Reasonably prompt delivery can now be made to those holding the necessary priorities.

Million-Volt X-Ray to aid industry at Rochester, N. Y.

• To be used by local industries, a million-volt X-ray machine, capable of disclosing defects in heavy castings in a matter of minutes, will be in operation soon at the University of Rochester, (N. Y.).

Described as one of the "most powerful in the world," the machine is being installed with the cooperation of eight local industries which will share its use. The university points out that the machine's value is not limited to war production, but "would play an important role in research on new processes and new products in the post-war era. A 10-ton overhead crane will facilitate the handling of heavy pieces of equipment into the X-ray room.

Wartime technology that will affect post-war manufacture

• Technological developments revealed during the past month which may radically affect post war mass production were numerous. Lenses for gun sights, binoculars and similar instruments are being ground 10 times faster than by hand, it is said, on new machines designed by American Optical Co., Southbridge, Mass. Diamond impregnated tools replace the loose abrasives formerly used.

Latest application of paper to replace metal is in steel pipe casing. Resin-filled, it is hard, stiff, but not brittle. A man can carry 70-feet of 3-inch pipe under his arm.

The End

OW TO SAVE ~~20~~ 80% OF YOUR NEW TOOL COS

Three New Advantages in Severance Regrinding Service

Beginning in January, 1943, the Severance Tool Company announces, (1) an additional saving of 33-1/3% to the customer for regrinding Midget Milling Cutters, (2) a special high speed tool hardening process, known as Severite, applied to tools after they have been reground. Severite hardens the teeth of a cutter increasing the life between regrinds from two to five times, and (3) 72-hour service—your renewed tools are shipped within three days of the time they are received at the Severance plants.

Write for complete facts about the new Severance regrinding process. And ask for the latest Severance "Toollog" showing the many types of new Midget Milling Cutters available.

Severance

MIDGET MILLING CUTTERS AND PRECISION REGRINDI

SEVERANCE TOOL COMPANY, SAGINAW, MICHIGAN · BRANCH PLAN

GREEN LIGHT
for the Iron Horse

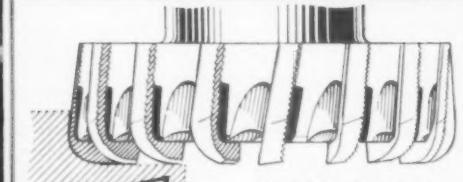
Swift movement of fantastic volumes of *must* freight—the rapid rail transport of administrative officials and troops—both are essential. Delays due to avoidable mechanical difficulties are criminal—may be tragic.

In car shop and locomotive plant, Gairing tools are sending to the erecting floors accurately finished parts for the rolling stock that will keep America's railroads functioning at top speed.

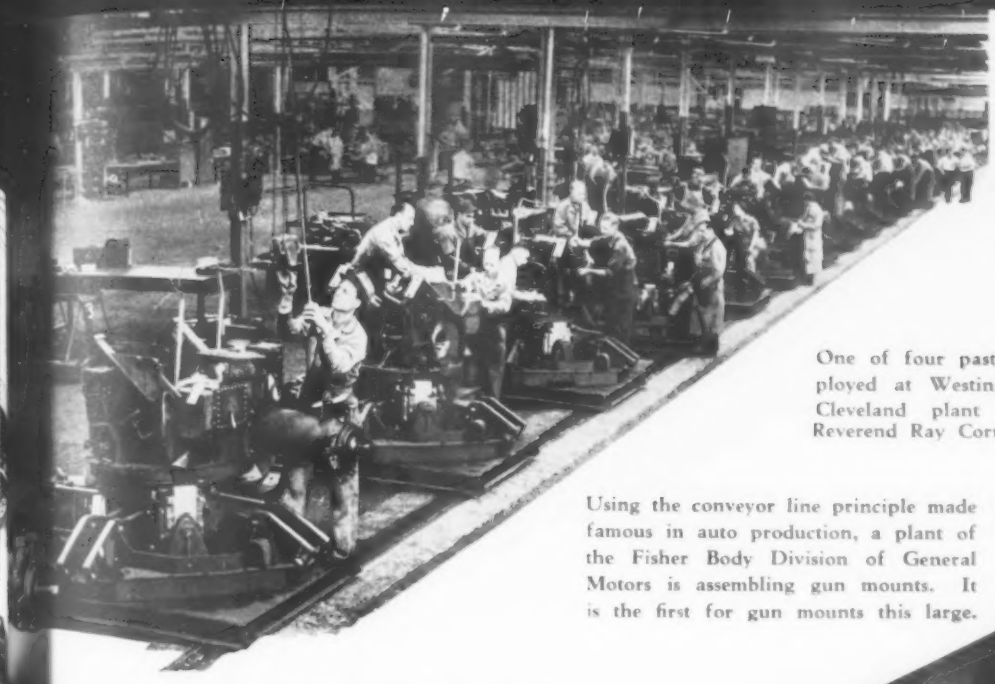
It takes fine cutting tools to build fine locomotives. Gairing makes that kind of tools—Standard, Special and Gair-Lock Inserted Blade cutting tools.

THE GAIRING TOOL COMPANY
Detroit, Michigan

GAIRING
FOR A QUARTER CENTURY SPECIALISTS IN FINE CUTTING TOOLS



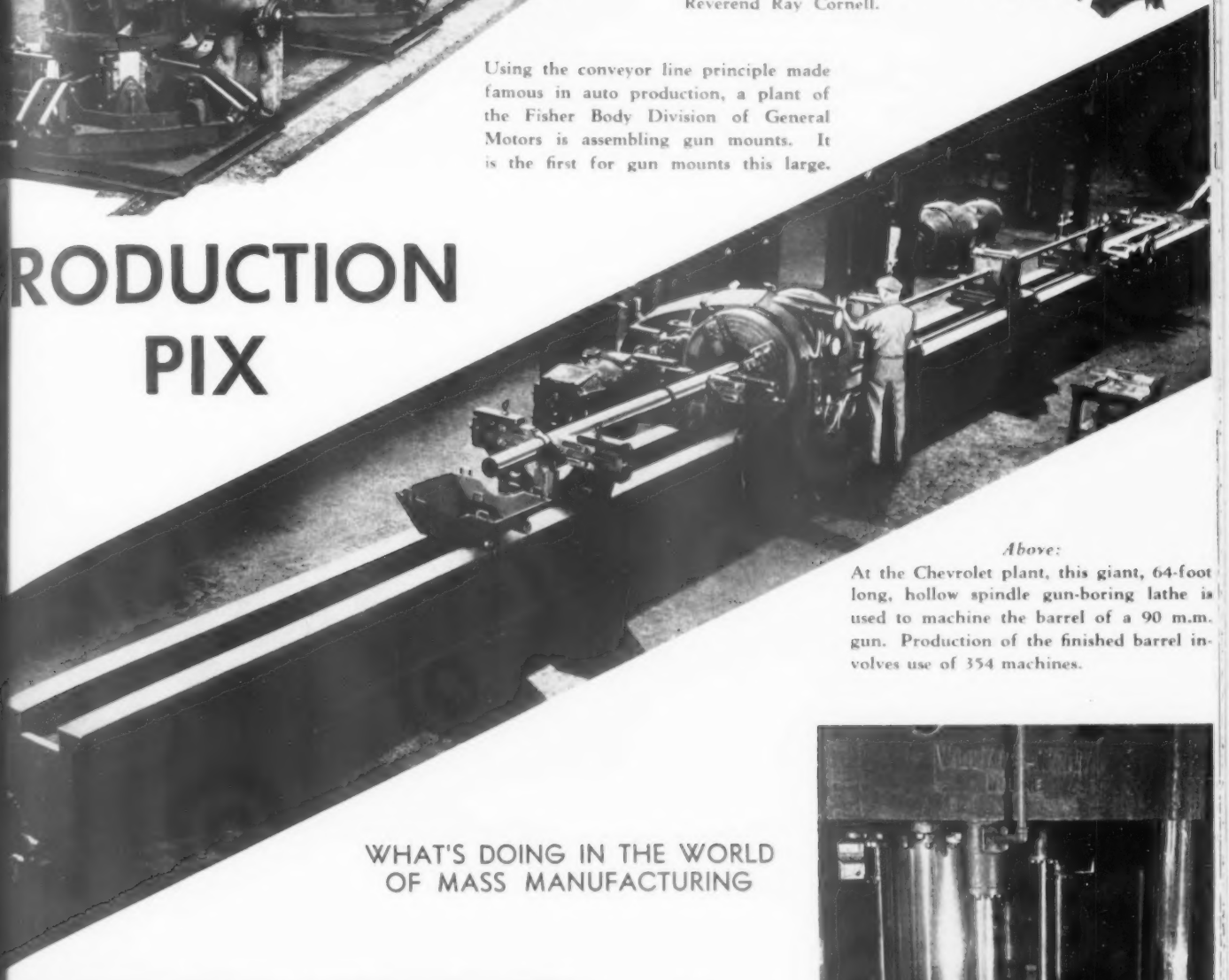
GAIR-LOCK
Inserted Blade cutter profiling locomotive main and side rods



One of four pastors employed at Westinghouse's Cleveland plant is the Reverend Ray Cornell.

Using the conveyor line principle made famous in auto production, a plant of the Fisher Body Division of General Motors is assembling gun mounts. It is the first for gun mounts this large.

RODUCTION PIX



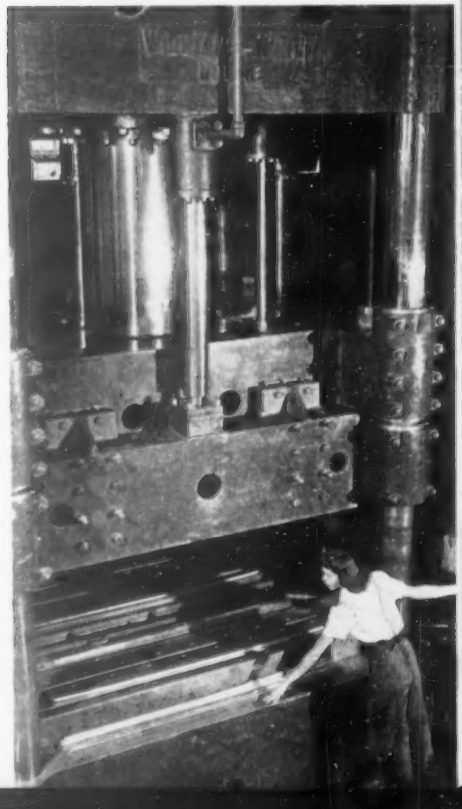
Above:
At the Chevrolet plant, this giant, 64-foot long, hollow spindle gun-boring lathe is used to machine the barrel of a 90 m.m. gun. Production of the finished barrel involves use of 354 machines.

WHAT'S DOING IN THE WORLD OF MASS MANUFACTURING

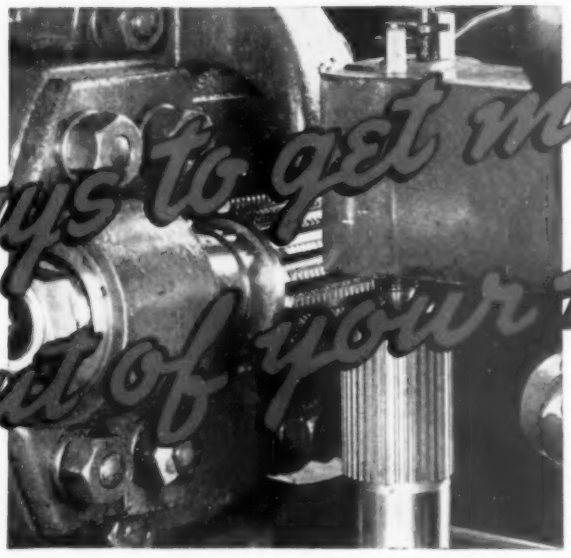
Left:
On the British production front: English women welding the turret in position on a Churchill tank.

•

Right:
Lydia Martinez is the first girl to be employed in the drop-hammer department of Consolidated's San Diego plant.



15 Ways to get more out of your Hobs



Hobbing a Zero-Backlash Involute Spline with MITCO Hobs.

ELIMINATING FLATS

Use of centralizing gages will not necessarily eliminate flats.

1. Best remedy usually is to increase the number of hob gashes.

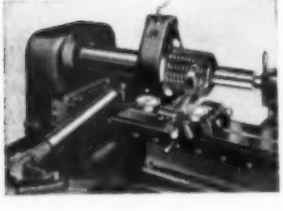
2. When cutting worm gears with small number of teeth, use tangential rather than infeed.

3. Check whether large lead errors were produced in grinding hobs incorrectly.

4. Hob runout or erratic flute spacing resulting from sharpening may cause flats.

5. Check also whether hob is mounted correctly in machine.

Sine-Line Contour Checker for Hobs



Sine-Line Lead Checker for Hobs

SHARPENING

A sharp hob cuts faster, with less power and wear, and will produce more accurate work with better finish.

1. Use a soft bevel or concave wheel of medium grain. Keep wheel clean as a glazed wheel may crack hob teeth.

2. When using ordinary tool grinders use a sharpening guide for spiral gashed hobs.

3. Grind hob tooth faces on centerline ("A" in drawing).

If undercut as at "B", hob tooth will cut too deep.

If ahead of center ("C"), tooth may drag on work.

If ground too far back ("D"), the tooth will be lower and gear contour will not be the same on both sides.

4. If a hob has a hook, be sure to maintain correct amount of hook as stamped on hub.

5. Check your ground hob on accurate equipment.

CORRECT SET-UP

The selection of the best cutting zone in a given hob has a tremendous effect on hob life, product accuracy and overall output.

1. Be sure there is no endplay of hob on arbor.

2. Be sure outer bearing is in place before clamping hob on arbor to prevent its springing out of line.

3. Check hub diameters with indicators graduated in ten-thousandths. Runout should not exceed 0.0002 in.

4. If runout exceeds this amount, loosen the clamping nut and rotate spacing collars to correct, these collars usually having slight errors in parallelism.

5. It is possible to select more than one "best" position of a given hob, by shifting it axially.

Sine-Line Hob Sharpening Checker

For further information on hobs and hobbing write on your company letterhead for Booklet 149-A.

MICHIGAN TOOL COMPANY

7171 E. McNICHOLS ROAD . . . DETROIT, U. S. A.

CAPITAL COMMUNIQUÉ

T.M. REG. U.S. PAT. OFF.

Synthetic rubber and high octane gasoline plant construction pushed. Directives deprive other programs of material deliveries. Wilson pushes aircraft production. Johnson means business in ordering greater machine tool subcontracting.

JAY A. BONWIT

Washington Correspondent for THE TOOL ENGINEER

SYNTHETIC RUBBER and high octane gasoline plant construction has been designated as being of prime importance in the "must" program. To facilitate rubber and gas output, the War Production Board has cut across the priorities system and resorted to directives.

The directives are based on the theory that while priorities can be used to insure deliveries of materials to more essential war programs at the expense of civilian production or less essential war output, the finishing facilities for some types of equipment are so inadequate that it becomes necessary to use the directive route, and divert some of the output of the short items.

Objections were raised from some quarters that the directives granted high octane and synthetic rubber "robbed" other programs, and delayed their schedules. This protest was countered with the statement that planes without gasoline and tires are of little value. The use of directives will be extended if a smooth operational plan to regulate them can be developed.

Idea would be worked out in conjunction with the Controlled Materials Plan. Materials would be allotted, and directives issued for delivery of equipment and parts.

Until a complete allocation system can be worked out, a large segment of industry will still operate on the basis of priorities. Already, WPB has had to move certain essential manufactures up on the AA scale of priorities.

★ ★ ★

WPB Vice-Chairman Charles E. Wilson is beginning to move in on his job as production expediter. Powers held by Wilson are specific in connection with aircraft, small ship and radio production, and are general as they relate to other phases of the war production program. Plan is to pay most attention to aircraft.

George H. Johnson indicates that he means business in seeking further subcontracting in output of machine tools. Order boards of companies engaged in machine tool production revealed large backlog. Idea will be to average out the order boards of producers, and spread the business where possible.

★ ★ ★

Actions of significance to the industry were as follows:

November 23 — In an attempt to clarify the situation in steel, the WPB issued a statement on supply, indicating that, while demand for certain types of steel — such as structural shapes and concrete reinforcement bars — is diminishing, there is a steady increase in demand for alloy steel.

November 27 — Conservation Order M-11-b, as amended, further controls use of zinc for civilian products, and places various precision instruments and dies in the non-restricted class.

December 2 — WPB issued Limitation Order L-223, restricting delivery of hard-facing materials to orders rated AA-5 or higher. AA-5 is required for the delivery of alloying materials, including cobalt, nickel, tungsten, chromium and others, except upon specific direction of the Director General for Operations, or when such materials, destined for use as hard facings, are for experimental purposes.

December 4 — Standardization and simplification of universal portable electric tools, including machine tool accessories, was ordered in Limitation Order L-216, and Schedule I, attached.

December 8 — WPB clamped down on "emergency" shipments of aluminum products prior to the month of normal allocation, by ordering that persons desiring to make such shipments must secure a written statement of approval from the military procurement officer who has jurisdiction over the contract.

December 11 — Designed to facilitate the change from PRP to CMP, certain changes were announced in the method of authorizing PRP units to purchase aluminum, magnesium, steel and copper during the first quarter of 1943. Use of priorities ratings on shapes and forms of aluminum and magnesium, listed in PD-25A, will be suspended, and procedure will be for manufacturers to place orders for their requirements, with the Aluminum and Magnesium Division allocating the metals on the basis of orders received by the producers. In copper and steel, ratings will be assigned on the PD-25A, but some relaxation in policy in granting additional quantities is indicated.

December 11 — WPB issued General Preference Order M-29, as revised, placing tighter control over cobalt. The order revokes M-29-b. Cobalt was placed under complete allocation.

December 11 — Interpretation of Supplementary Order M-21-d indicates that specific allocations of corrosion and heat resistant steel authorized by form PD-391 supersede delivery restrictions of M-21-d, and deliveries are permitted if so allocated, even though they may carry a lesser rating than AA-5. The M-21-d order restricted delivery to AA-5 or higher orders.

December 12 — WPB amended General Preference Order E-2-b, to provide that no person shall sell or deliver and no person shall receive delivery of special cutting tools in excess of a quantity sufficient to meet the manufacturer's minimum practicable manufacturing quantity. Purchasers are limited to inventories of 90 days supply of tools.

December 14 — WPB established complete control over the production and delivery of carbon steel made in electric furnaces with issuance of an amended Conservation Order M-21-a.

Simultaneously, action was taken affecting tool steel production as follows:

1. **M-21-h**, a new order, was issued, establishing control over the production of carbon and alloy tool steels.

2. **Order M-14** was revoked, and the tool steel provisions contained in M-21-a were revoked.

3. **Producers** of all tool steels must submit their melting and delivery schedules for the approval of the Director General for Operations.

4. **To conserve molybdenum**, an order restricts monthly production of certain high-molybdenum type steels to 30 percent of the monthly average tonnage melted during the second quarter of 1942. Delivery of these tool steels is limited to 75 per cent of the same base period in the fourth quarter of 1942, and to 35 per cent in the first quarter this year.

December 21 — Amendment to General Preference Order E-1-B issued, providing that orders for machine tools placed after December 25 must be accompanied by a photostatic copy of the preference rating certificate under which the buyer obtained his rating, or by a certified copy. THE END

LABOR SUPPLY

● Jay Bonwit reports, in a last minute message from the nation's capital, that labor supply is fast becoming the paramount problem in the entire production outlook. Real pinch, he says, will develop in the latter part of this year.

Questions of extending work week, featherbedding and labor draft will be political footballs until early summer, with the cooperation of industry and labor sought. Failure of this expedient will bring stern remedial action.

Before plastics can be used in production, some of their important mechanical properties must be known. Here, an expert reveals some of the latest data available.

PLASTICS

T. S. CARSWELL

DIRECTOR OF RESEARCH, PLASTICS DIVISION,
MONSANTO CHEMICAL COMPANY

IN THIS ARTICLE I shall try to point out a few of the important properties of plastics insofar as they are of interest for practical mechanical applications.

Before the war, plastics were largely used for decorative and ornamental purposes. Their use as practical materials of construction in the mechanical field had barely started. The electrical engineer had been acquainted with plastics for quite a long time because he could make good use of their excellent insulating qualities. The production engineer had made very little use of plastics, particularly because he was not familiar with their mechanical properties.

The plastics industry is now fully aware of this lack of information, and rapid strides have already been made toward supplying the engineer with the design data he needs.

Thermoplastics

Plastics are usually divided into two broad classifications. The first classification covers thermoplastics. As the name indicates, thermoplastics are materials which soften under heat and become sufficiently plastic so that they can be molded. They harden on cooling.

This classification includes such materials as polystyrene, cellulose acetate, cellulose nitrate, many of the vinyl resins, and a number of other less widely used materials. They are useful in that they can be rapidly molded by injection through a heated orifice into a cold die. The cycle is rapid, and as many as four pieces per minute may be obtained from a single die cavity. Inasmuch as an injection die usually has multiple cavities, as many as one hundred pieces per minute are often obtained.

Thermosetting plastics

The other classification covers thermosetting plastics; materials which harden through a chemical reaction under the influence of heat, and once cured they cannot again be molded. Pressure usually has to be employed during the molding operation, because water is given off during curing. At the temperatures employed, this water would escape in the form of steam and cause bubbles and blisters if the piece were not confined under pressure. The thermosetting materials comprise such products as the phenol-aldehydes, ureas, and the newest-comer, melamine resins.

Temperature effect

The effect of temperature is of utmost importance in considering the usefulness of a plastic. Our armed services fully recognize this, and usually specify that plastic parts must be operable and must retain their desirable properties over a range of temperatures from −40° F. to +160° F.

Engineers accustomed to working with metals may not think this is a wide temperature range. However, metals change in properties with temperature. Figure 1 shows in a rough way the effect of temperature on the tensile properties of steel. You can see that in the range of from 0° F. to 200° F. there is virtually no change in strength. A rapid change does not take place until at about 800° F. The situation with plastics is quite different, in that plastics are quite sensitive to temperature changes in the range from 0° F. to 200° F.

Figure 2 shows the effect of temperature upon the impact strength of a number of plastic materials. You will note that four of these are thermoplastics—cellulose acetate, cellulose nitrate, polystyrene, and polyvinyl butyral. As can be seen from the figure, these materials are all relatively tough at room temperature, and their toughness appears to increase as the temperature is raised, up to a certain point.

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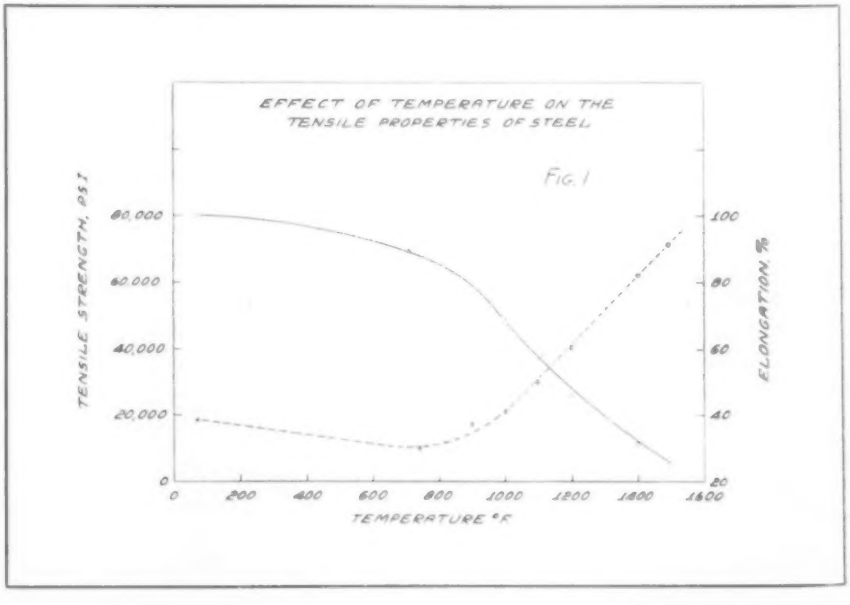

We pay
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Ordnance Engineers
For designing
The Tanks
Which were the Spearhead
of the Smashing
North African Campaign

Gerotor May
Division of
May Oil Burner Corporation
Baltimore Md.

(Continued from page 126)

Actually, this increase in toughness is only apparent, because softening sets in and makes these materials inapplicable for most practical purposes below the maximum shown in the figure. As the temperature is lowered, these materials increase in brittleness until a minimum is reached, after which the impact strength remains at a low value. This minimum low value is reached at temperatures only a little below the freezing point of water.

Phenolic molding compositions

This figure also shows impact strength as a function of temperature for three types of phenol-aldehyde molding compositions: namely, compositions which contain woodflour filler, fabric filler, and cord filler. It can be seen that the phenolic molding composition with woodflour is brittle at any temperature. However, there is virtually no change in the impact value until the temperature of nearly 160° C. is reached. The other two types of phenolic material are much tougher than the woodflour-filled. As the figure shows, they increase somewhat in toughness as the temperature is raised until a drop takes place at about 155° C.

It is important to note that while these materials drop in impact strength as the temperature is lowered, the drop is by no means so sharp as in the case of the thermoplastic materials. This relative lack of sensitivity to temperature is one of the important and valuable properties of thermosetting plastics.

Flexural strength

Figures 3 and 4 show the effect of temperature variations upon the flexural strength of various types of phenol-aldehyde molding powders. The flexural strength drops off as the temperature increases. However, as in the case of the impact strength, there is no critical point at which the properties change rapidly. It will be noted that these materials still retain most of their strength at temperatures in the neighborhood of 160° F., or about 70° C.

The figures previously referred to do not tell the whole story of the effect of temperature. The data for these figures were obtained by conditioning test specimens for about 30 minutes at the temperatures indicated. We have felt that it was important to

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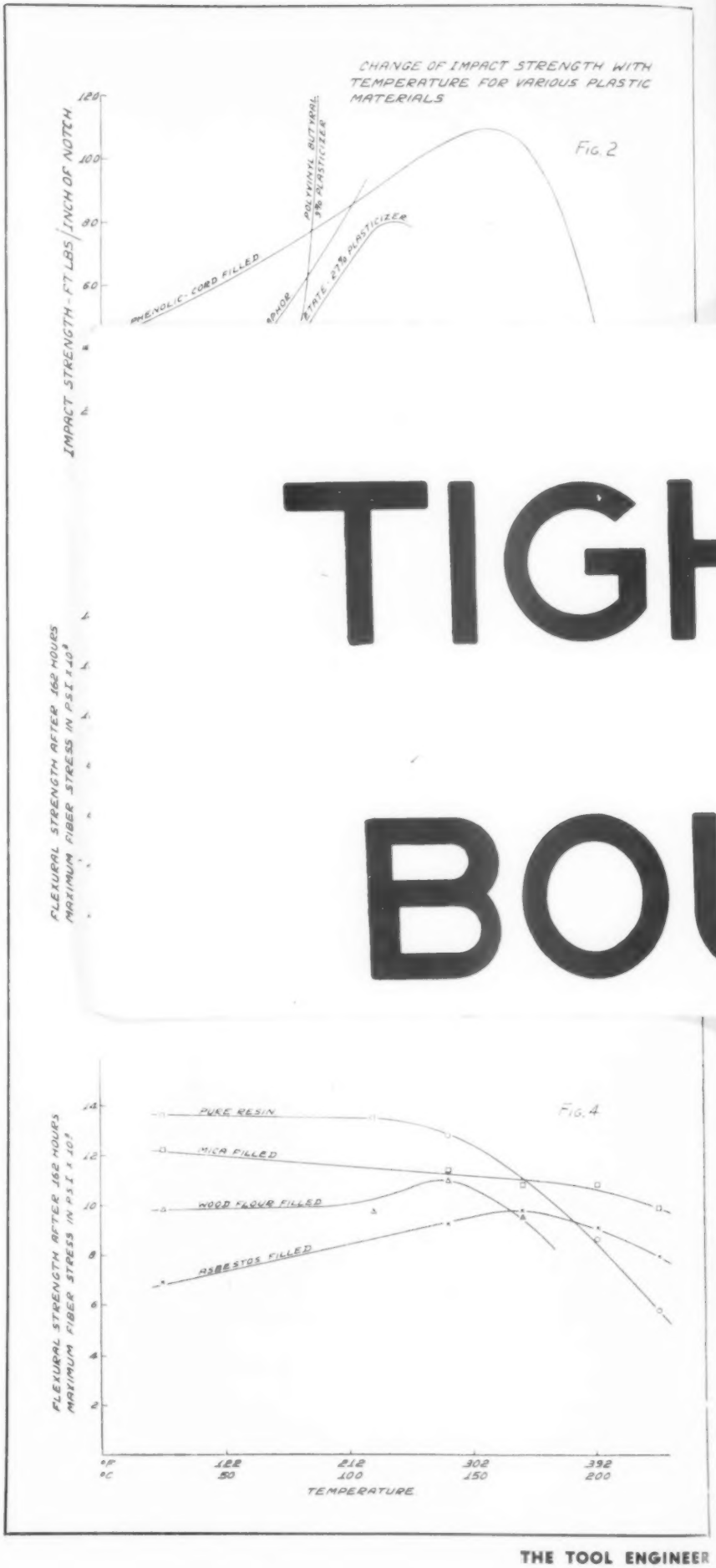

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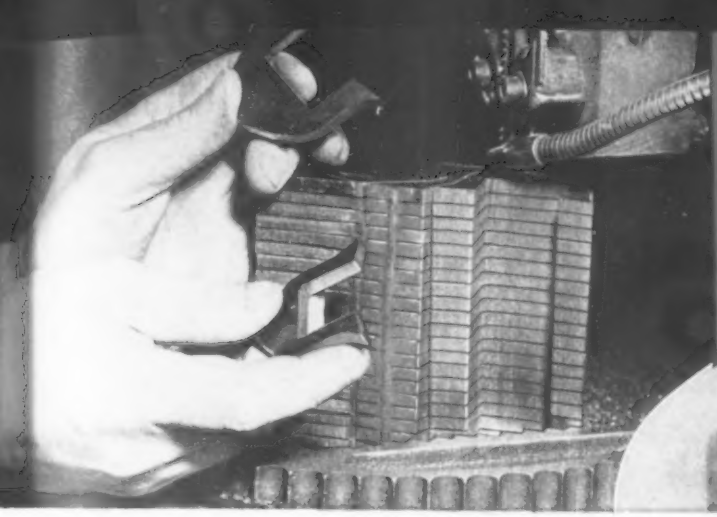

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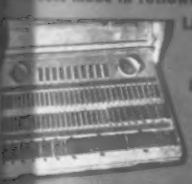

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INSPECTION Set, 4 millionths of an inch
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for data on good deliveries.

DoAll Surface Grinder

Finest grinder made for those who require high precision accuracy as to size, flatness and parallelism. Adaptable to wet or dry grinding.

Savage Tool Co., Savage, Minn.

DoAll BAND SAWS

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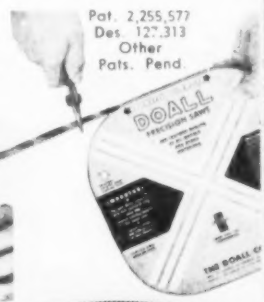
Des. 127,313
Other Pats. Pend.



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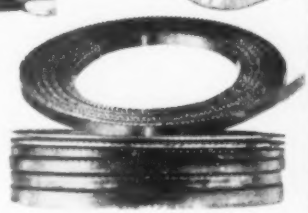
The finest blading made, with extra hardened sawing edge. Each box contains 100 feet of band saw, which has passed triple inspection. A window slot shows instantly how much saw remains in box. Through another slot, blading is drawn out and cut off as needed.



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Flexural strength

Figures 3 and 4 show the effect of temperature variations upon the flexural strength of various types of phenol-aldehyde molding powders. The flexural strength drops off as the temperature increases. However, as in the case of the impact strength, there is no critical point at which the properties change rapidly. It will be noted that these materials still retain most of their strength at temperatures in the neighborhood of 160° F., or about 70° C.

The figures previously referred to do not tell the whole story of the effect of temperature. The data for these figures were obtained by conditioning test specimens for about 30 minutes at the temperatures indicated. We have felt that it was important to

(Continued on page 131)

CHANGE OF IMPACT STRENGTH WITH TEMPERATURE FOR VARIOUS PLASTIC MATERIALS

Fig. 2

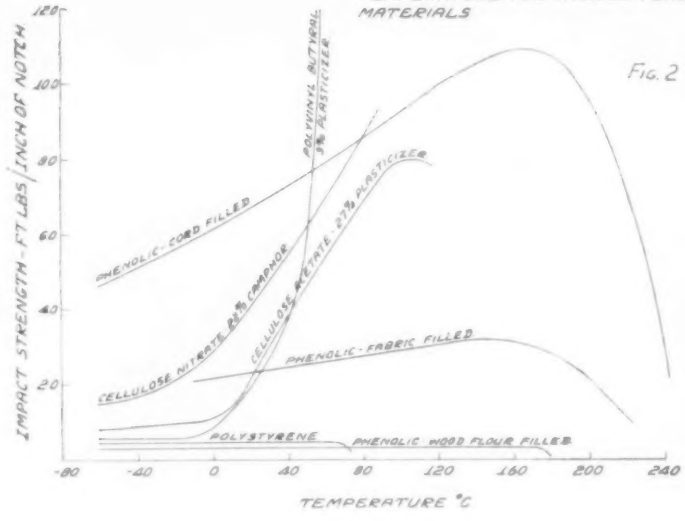


Fig. 3

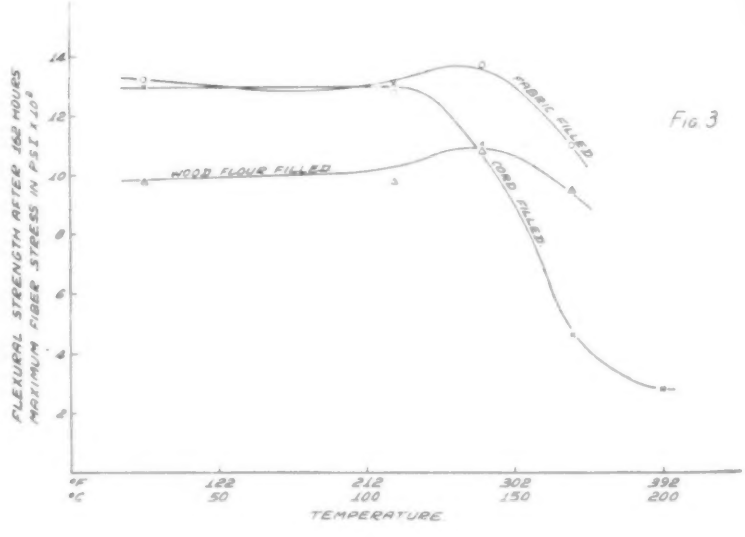
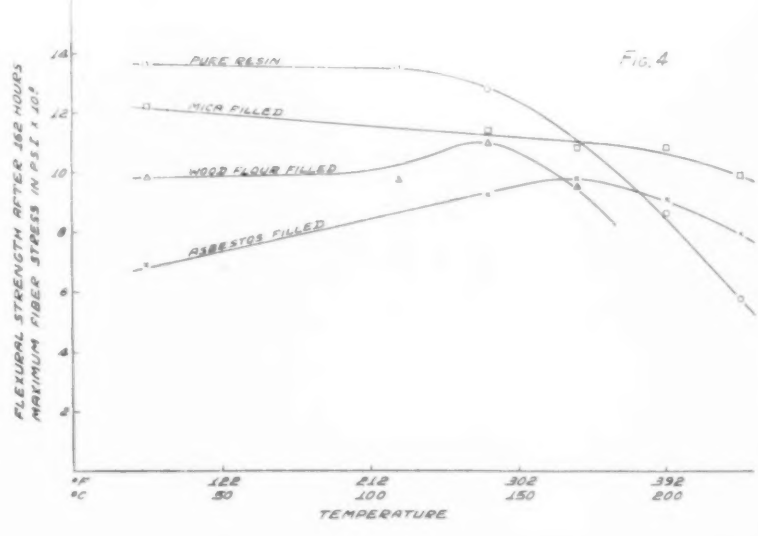


Fig. 4



They would say, "Mister, get busy and send this job to the new DoAll Saw Clinic. They will tell you the best saw to use for greater speed and a smoother finish. Your blading will last much longer and you'll save man hours and metal."

Example—An Eastern lock manufacturer sent in the job above —parts to be cut from 5/32" steel. We recommended that they cut 13 parts at one time and use a 3/16" wide, DoAll Saw, 10 pitch, A temper, Raker set .042, Speed 160 feet per minute with 25 lbs. pressure on straight cuts, 20 lbs. on contours.

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Take advantage of this free service. Send us your actua terial for a series of tests and receive a complete written with our findings.

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Des. 127,313
Other
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first—Included in the Manual is a time-saving Tool Index that aids in quickly locating the correct tool steel for the type of tool you want to make. It greatly simplifies the problem of selecting the right tool steel for a new tool, and helps to assure better tool performance and increased production.

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Carpenter MATCHED TOOL STEELS

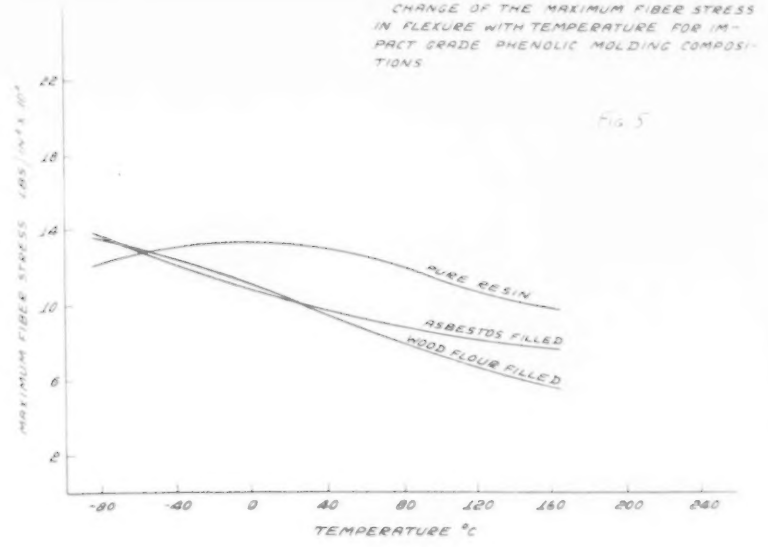

Fig. 5

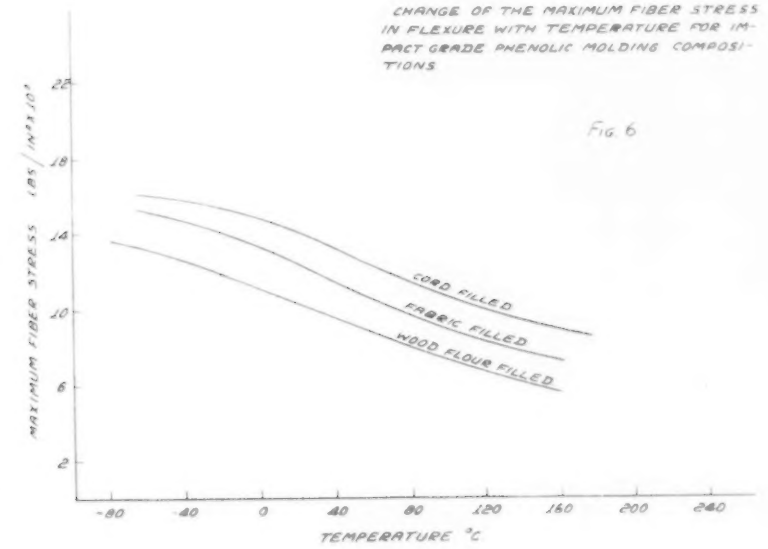

Fig. 6

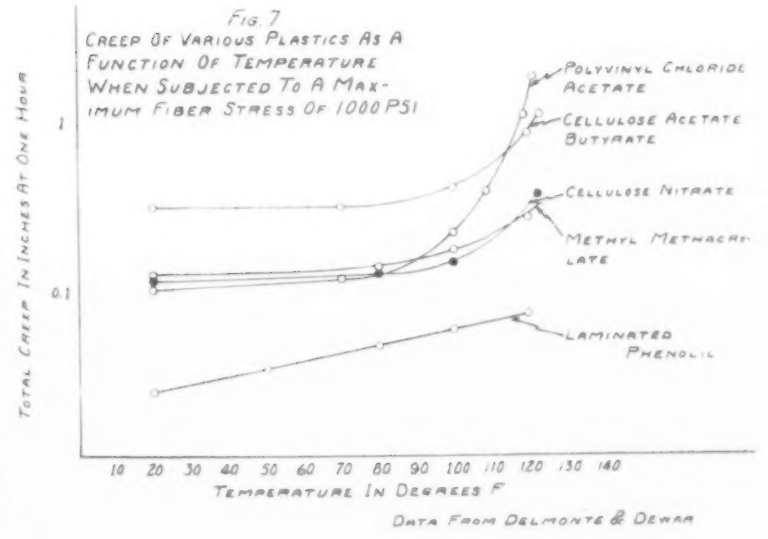
Fig. 7
Creep Of Various Plastics As A Function Of Temperature When Subjected To A Maximum Fiber Stress Of 1000 PSI
Total Creep In Inches At One Hour
1
0.1
Polyvinyl Chloride Acetate
Cellulose Acetate Butyrate
Cellulose Nitrate
Methyl Methacrylate
Laminated Phenolic
10 20 30 40 50 60 70 80 90 100 110 120 130 140
Temperature In Degrees F
Data From Delmonte & Dewar

(Continued from page 128)

know the effect of long continued temperature. We therefore made another series of studies in which test bars were held at elevated temperatures for long periods of time. The strength properties of the bars were then determined at room temperature.

Figures 5 and 6 show the effect of this long continued heating upon various types of phenolic molding powders. As the figures indicate, molding powders containing inorganic fillers, such as asbestos or mica, maintain, or in some cases slightly increase in strength when heated for 162 hours at temperatures as high as 200° C. The materials containing cellulosic fillers, such as fabric, cord, or woodflour, are unaffected by long heating at tempeatures up to about 110° C. At temperatures over this, they begin to deteriorate rapidly, and consequently cannot be recommended for such service.

Creep increase

Creep is an important property which the design engineer must consider. Our data on creep in plastics is still scanty, although a considerable amount of work is being done in this direction.

Figure 7 gives some creep data for a number of plastics over a range of temperatures. As can be seen from the shape of the curves, the thermoplastics begin to show rapid creep at temperatures in the neighborhood of 100° F. Data for only one thermosetting material is given in this figure, and this is a laminated phenolic.

The creep appears to increase as a linear function of temperature over the range studied, but in the temperature range studied there is no sudden increase in the creep rate. We now have extensive work going on to determine the effect of higher temperatures on the creep of thermosetting materials.

■

The tool industry can materially assist and accelerate the use of plastics in the field of mold production. If the tool industry could develop rapid and economical methods for mold construction, the use of plastics would be greatly accelerated. The plastics industry can help by developing plastics which will cure more rapidly, and will require lower pressures. We are working to this end.

THE END

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Mac-its are heat treated to multiply the strength of every ounce of steel used in them. Designs that take advantage of these stronger screws save man-hours, machine-hours and metals.

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When You See This Tag On An OK Tool

PLEASE BE SURE TO READ IT CAREFULLY

There's a wrong and a right way to use even the simplest cutting tool. In these days, when many operators are still in the learning stage, they need all the help they can possibly be given.

This red-bordered tag, henceforth attached to O K Single Point Metal Cutting Tools, bears instructions for setting up, also helpful hints in metal cutting practice for beginners. If heeded, its message should speed up production and reduce tool wear and breakage.

THE O K TOOL COMPANY
•
SHELTON CONN.

HELPFUL HINTS for the MACHINE OPERATOR
If the tool attached to this tag is our shankless type (shown above), for quick assembling, insert bit into holder from one side — mate the serrations properly — seat rear angle of bit firmly against tool holder — then lock the clamp down tight onto the bit with the wrench provided.
With our shank type holder (shown at right), locate tool bit squarely on the seat, with shank inserted, and tighten clamp against back of bit. Always use the wrench that came with the holder. Use no "extensions."

(Front)

O K Tools are as sturdy and trouble-proof as good design and materials can make them; but they are PRECISION tools and should be treated as such. To new operators, we offer these general suggestions:
Select tools of proper shape.
Consult your foreman as to correct feed and speed to be used.
Keep tool bits sharp.
When regrinding tool bits, use free-cutting grinding wheel. (We suggest 46 Grade.) Do not force grinding until the bit overheats and has to be dipped into water!
If locking device becomes damaged through accident, report it to your foreman before proceeding.
When through, don't heave the tool onto a crowded bench. Return worn-out tool bits to the tool crib.
THE O K TOOL COMPANY
SHELTON, CONN., U. S. A.
Originators & Sole Manufacturers of the
OK SYSTEM
OF INSERTED-BLADE METAL CUTTING TOOLS

(Back)

TRADE OK MARK
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TOOL SYSTEM

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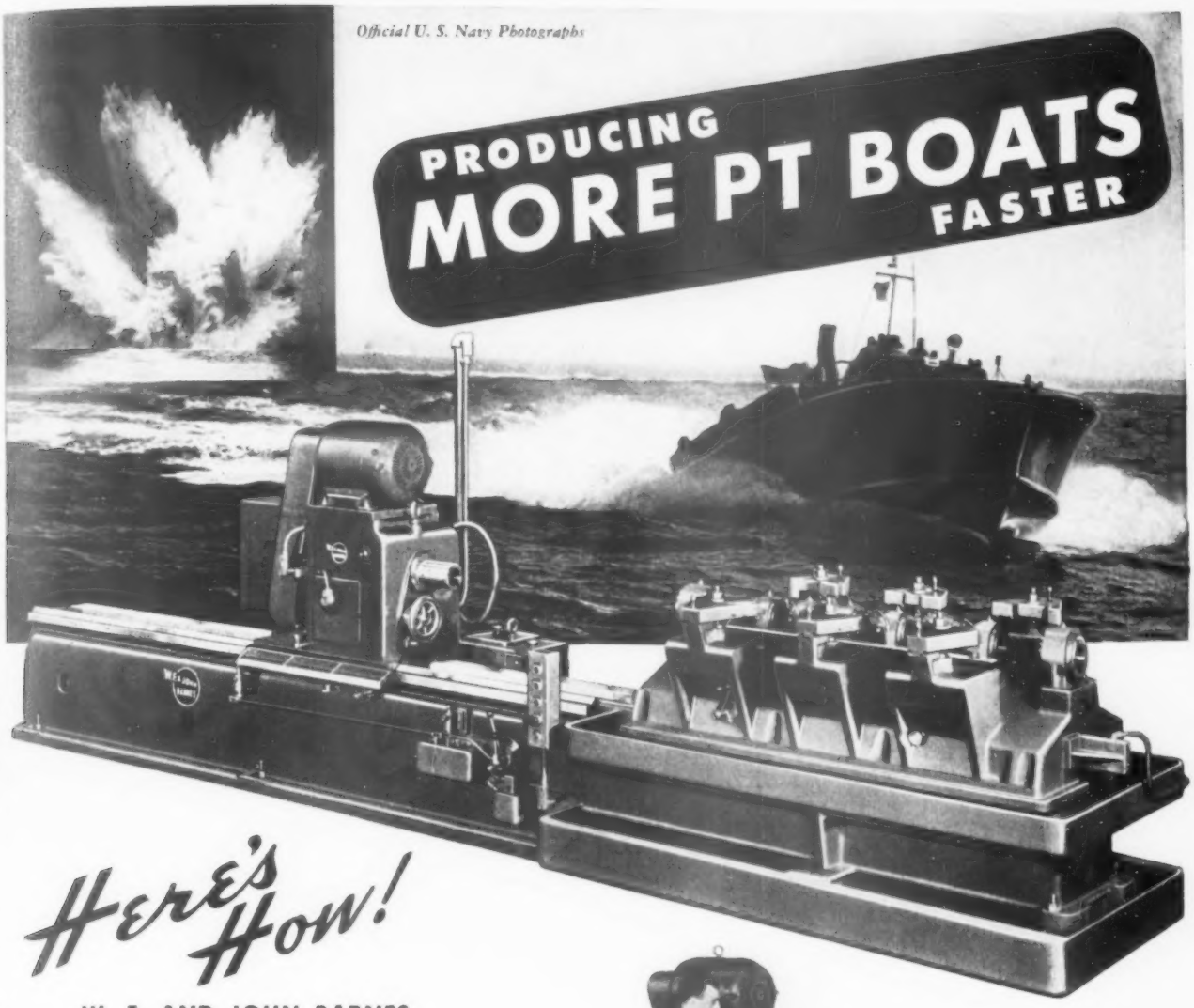
PRODUCING MORE PT BOATS FASTER



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The machine shown above, used for boring the main bearings, is equipped with hydraulically-actuated feed and traverse, and is of our unit design. The part is elevated by means of cam and crank arrangement to permit inserting of multi-tool line boring bar. Perfect alignment of bearings is assured.

At the right, is a machine designed for facing both sides of main bearings with one set-up—eliminating the laborious and time consuming methods previously used. By using W. F. and John Barnes

machines like the one shown, only ONE set-up is required. The positive hydraulic feed of the part to one set of milling cutters and reverse feed to another set of milling cutters, provide a fast and accurate means of holding close limits and assuring consistant duplication of machined parts.

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You are welcome to a copy of this well-illustrated booklet. No charge. Write on your company's letterhead.

If you have a certain problem, send full data including type and size of material, length of stock before cutting, length of cut-off pieces, production per hour desired, etc.

Campbell

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ANDREW C. CAMPBELL DIVISION
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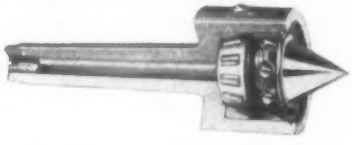

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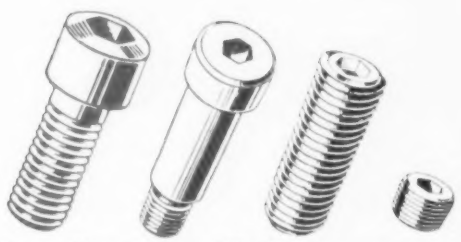
That policy has put Parker-Kalon Quality-Controlled Socket Screws on the "preferred list" of a good share of the power tool builders, and the makers of the motors that drive them. For P-K Socket Screws are made to the same uncompromising standard. "Doubtful screws" . . . screws that *look* all right but some of which fail to *work* right . . . are barred by the unequalled quality-control routine of the Parker-Kalon Laboratory. P-K Screws have the extra dependability to stand unexpected strains . . . yet they cost no more. Parker-Kalon Corporation, 190-198 Varick St., New York.



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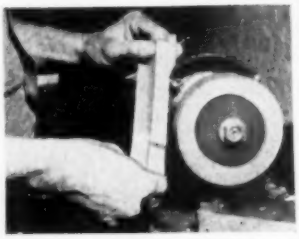

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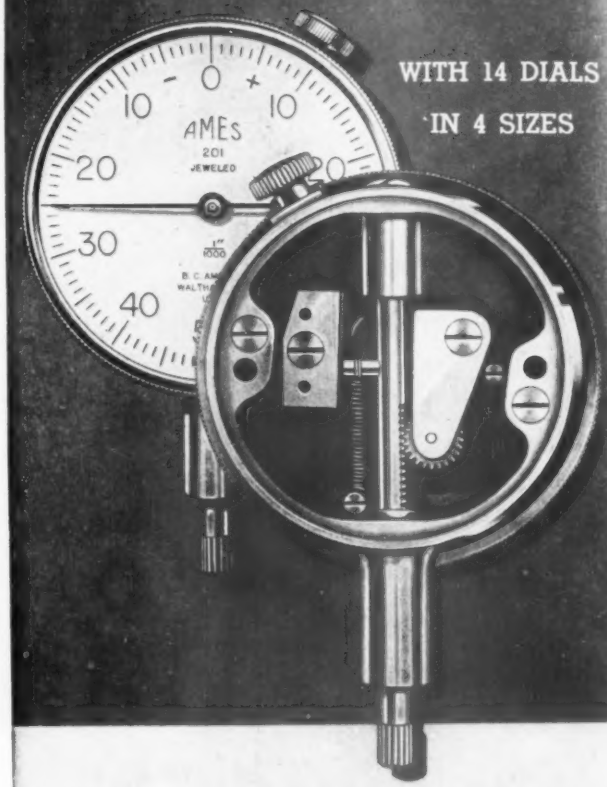

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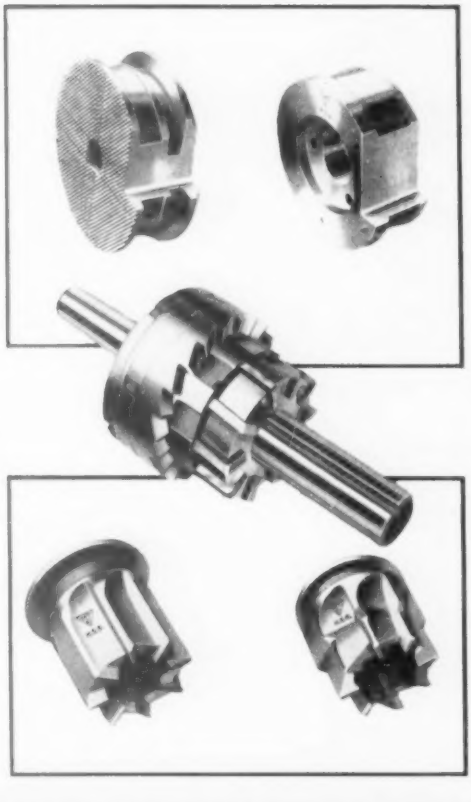

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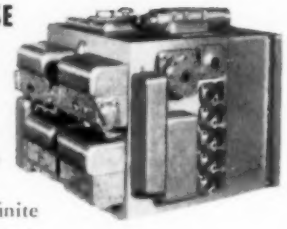

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Your highly skilled men now working on the precision machine tools used in manufacturing mechanical feed transmissions, can be used on other precision work in your plant — ***improves your skilled manpower position.***

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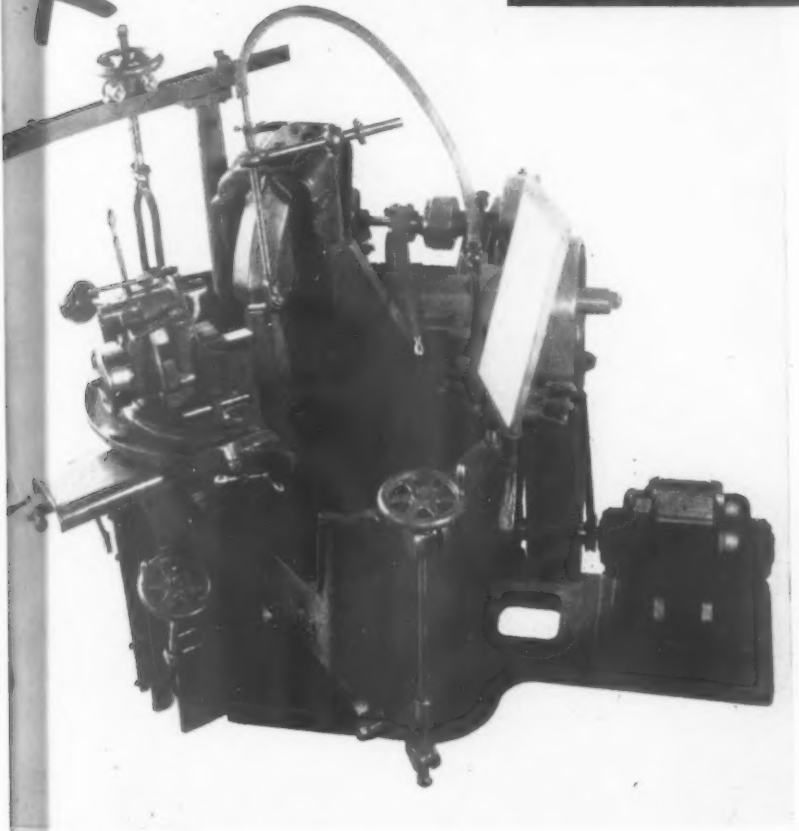

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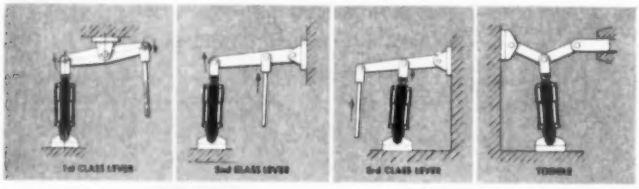
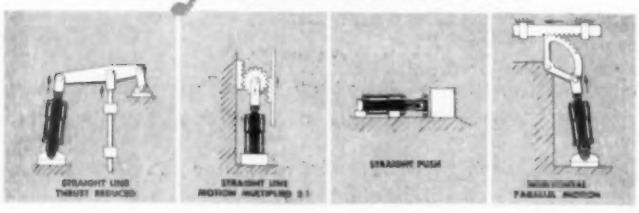


Hanna
AIR and HYDRAULIC
Cylinders

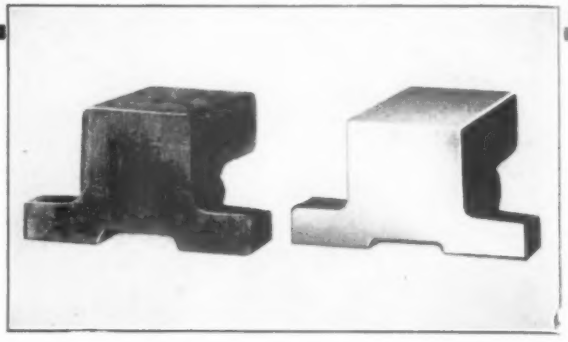


THESE catalogs will help you determine the size and capacity cylinder best suited for your requirements. They contain full specifications of the broad line of standard Hanna Cylinders which are available in a variety of mounting styles. Write for Catalog No. 229 on High Pressure Cylinders, and Catalog No. 230 on Low Pressure Cylinders.

HANNA ENGINEERING WORKS
1765 ELSTON AVENUE • CHICAGO, ILLINOIS
RIVETERS • CYLINDERS • AIR HOISTS

When It Must Be:

★ 1. DEAD FLAT . . .
★ 2. EXACTLY SQUARED . . .
★ 3. GLASS SMOOTH . . .



This PORTER-CABLE WET-DRY SURFACER

will do it to Finer Limits . . . FASTER!

What would it cost you to do this job on your milling machine? . . . an actual production job turned out in jig time on a PORTER-CABLE WET-DRY SURFACER. The specifications say it must square true to 90°, with both surfaces finished dead flat and glass smooth. Yet operators of average skill have no trouble in meeting the specifications. The speed they maintain makes it a big saving to do the operation on the WET-DRY SURFACER.

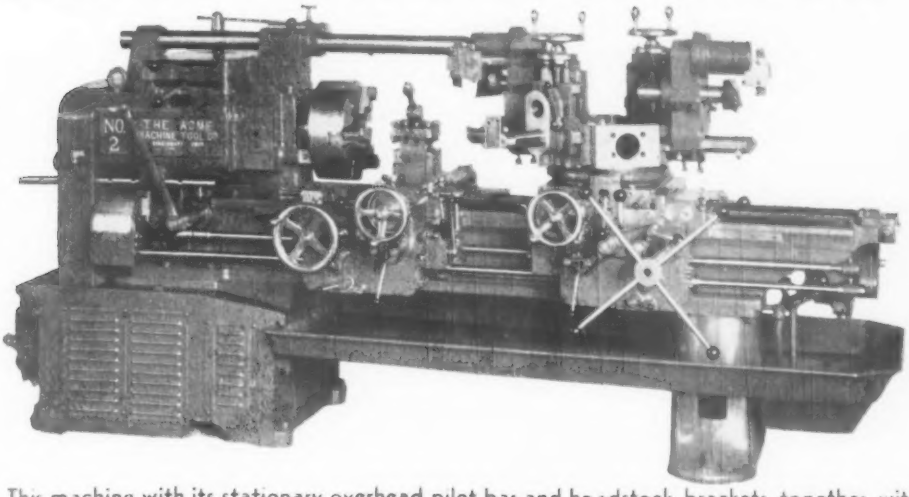
PORTER-CABLE WET-DRY SURFACERS are relieving the pressure on millers, shapers and planers in scores of plants. Much of the work is done free hand, though for close limits up to .0005", simple fixtures are used.

Various models of the WET-DRY SURFACER are readily adaptable to many secondary operations such as burring, linning, finishing, cutting radii and the like. Production men find them especially valuable where work must be fitted to the capabilities of women and unskilled workers, because their simplicity of operation insures speed, accuracy and safety.

● Learn about this new machining method that's a revelation in many shops — the new, low-cost way to increase production and relieve over-burdened major machine tools. Write ***today*** for copy of Free booklet, "Wet-Dry Belt Surfacing," without obligation.

PORTER-CABLE MACHINE CO.
1610-1 N. Salina St.
Syracuse, N. Y.

RIGIDITY and ACCURACY
UNDER HEAVIER CUTS AT FASTER SPEEDS!



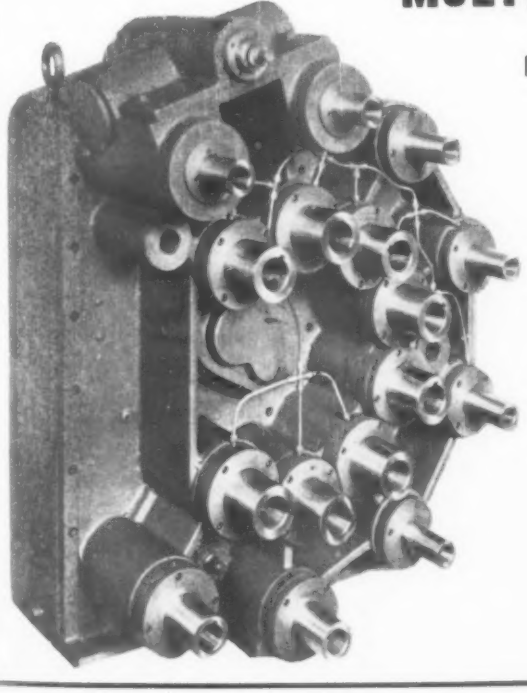
No. 2 Universal Turret Lathe with stationary overhead pilot bar and headstock brackets. Heavy duty multiple turning heads and vertical side tools and heavy duty reversible cutter holders. Also shown is the lead screw type chasing attachment with split nut brackets and threading dials on both carriages.

This machine with its stationary overhead pilot bar and headstock brackets together with rigid turret tooling permits heavy multiple cuts. Thus accuracy is assured, while faster speeds are possible through the use of cemented carbide cutting tools.

WRITE FOR COMPLETE DETAILS

THE ACME MACHINE TOOL COMPANY
CINCINNATI, OHIO

IF IT IS A *Buhr*
MULTIPLE PRODUCTION DRILL HEAD



IT IS GOOD FOR 24 HOUR PRODUCTION

Sixteen-spindle Buhr Drilling, Counterboring, Facing and Reaming Head, designed for the left-hand head of a 2-way Machine. Vertical adjustment. Two top spindles are accelerated to give three times the feed of the other spindles. Oil pump provides positive lubrication.

BUHR MACHINE TOOL CO.
ANN ARBOR MICHIGAN
Specialists in Multiple Spindle Drilling, Boring, Reaming, and Tapping Equipment

MEMO

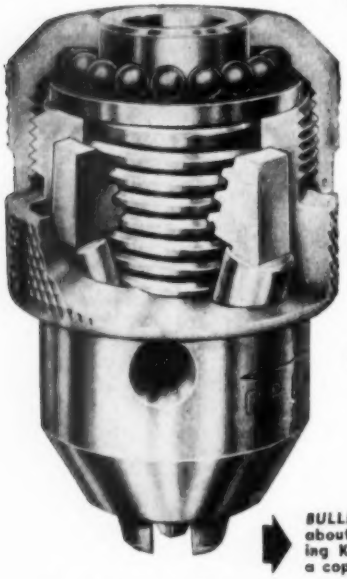
To Shop Foremen about

Ettco-Emrick

KEYLESS DRILL CHUCKS

If you are using Ettco-Emrick Drill Chucks, we don't have to tell you what sturdy, well-made tools they are and what excellent service they give. Nor do we have to tell you what a big advantage the **keyless** feature is, especially for women operators because it takes no strength to tighten the chucks.

You know, too, that you don't have to baby Ettco-Emrick Drill Chucks and that they can take a lot of punishment. But it's vital now to make tools last as long as possible. So we suggest you save these chucks from unnecessary abuse, particularly at the hands of inexperienced men and women operators, by passing on to them the following few DON'TS.



DON'T use a wrench or hammer to tighten these chucks. Remember they are **keyless**. Drilling action does the tightening.

DON'T fail to insert the drill shank full length into the chuck.

DON'T run the chuck jaws into the work.

DON'T use a wrench or hammer to remove the chuck from drill press spindles—always use a drift pin.

DON'T attempt to take the chuck apart without knowing exactly how to do it. When in doubt call or write and we'll tell you the right way.

BULLETIN No. 6 gives full details about these time and energy saving Keyless drill chucks. Write for a copy today.

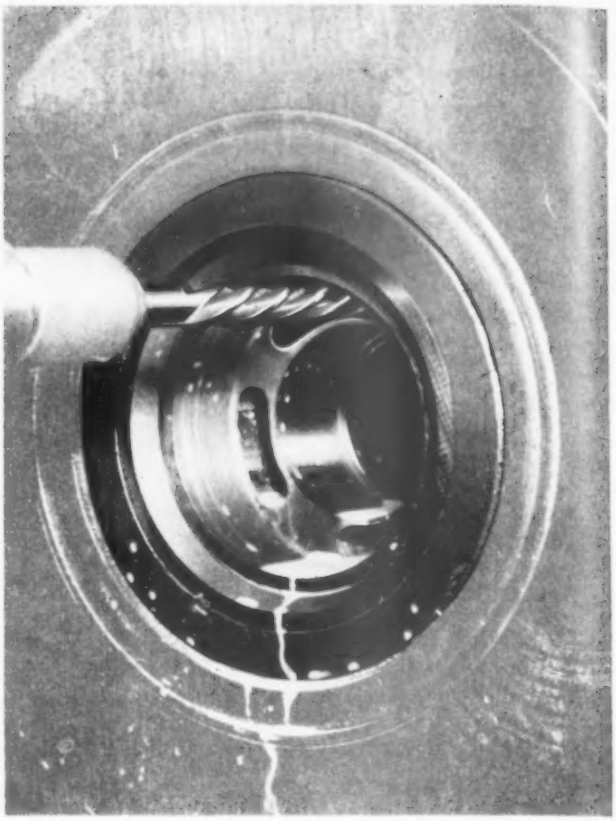
Ettco-Emrick KEYLESS Drill Chucks are also stocked to fit all makes of portable electric drills.

ETTCO TOOL CO.

586 Johnson Ave., Brooklyn, N. Y.

Detroit Chicago

The Famous Ettco-Emrick DRILL CHUCKS • TAP HOLDING CHUCKS
TAPPING ATTACHMENTS • TAPPING MACHINES
MULTIPLE SPINDLE TAPPING AND DRILLING HEADS
Unexcelled for Design, Materials and Workmanship



CONTOUR MILLING AT GREAT DEPTH

. . . Just the job for **PUTNAM**

HI - SPEED END MILLS

This is another of those tough armament jobs on which Putnam Hi-Speed End Mills excel. The steel is hard . . . the cut is intricate . . . good finish is required.

Illustrated is a standard Putnam Hi-Speed Extra Long End Mill milling four radial slots in the breech housing on an anti-aircraft gun. The slots themselves are deep and in addition are recessed in the face of the piece. This means great strain on the mill. Putnam Mills have been doing the job with a minimum of breakage . . . and, therefore, a minimum of production time lost.

PUTNAM TOOL COMPANY

2987 Charlevoix Ave. • Detroit, Michigan

NEW Rouse HAND MILLER FOR SMALL PARTS

The NEW Rouse Hand Miller will help you speed up your small parts production, and enable you to get maximum output with inexperienced help.

The Rouse Hand Miller is a high-speed, ball bearing, motor driven machine for making light cuts in brass, aluminum, and steel. It will handle efficiently small rounding and burring operations on steel and cast iron parts.

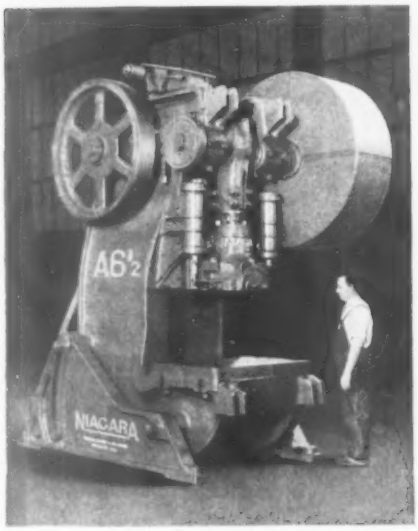
Priced low, the machine can be kept set-up for special operations with minimum machine-hour cost.

It has proved itself in the production of airplane parts, radio equipment, motor parts, instruments, light ordnance, and similar work.

The Rouse Hand Miller is an accurate, sturdy machine, the development of many years of experience in producing fine small tools and parts. Prompt delivery can be made. Write, telephone, or wire for full information.

$98.00
(Without Fixtures)
F. O. B. Chicago
Motor Extra

H. B. ROUSE & COMPANY
2214 NORTH WAYNE AVENUE CHICAGO, ILLINOIS

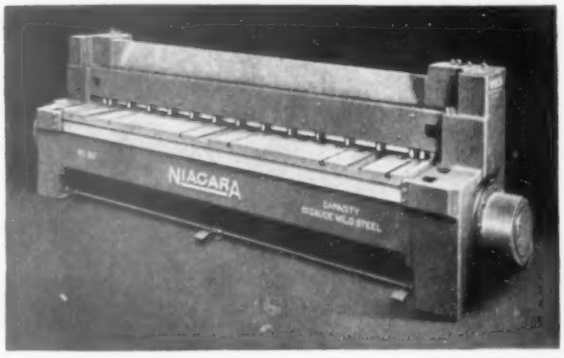


SERVING WAR PLANTS

Niagara Presses and Shears are increasing output of fighting material. Just one example of their many advanced engineering features is the instant-acting Niagara 14-point engagement sleeve clutch which increases both the efficiency of the press and the operator.

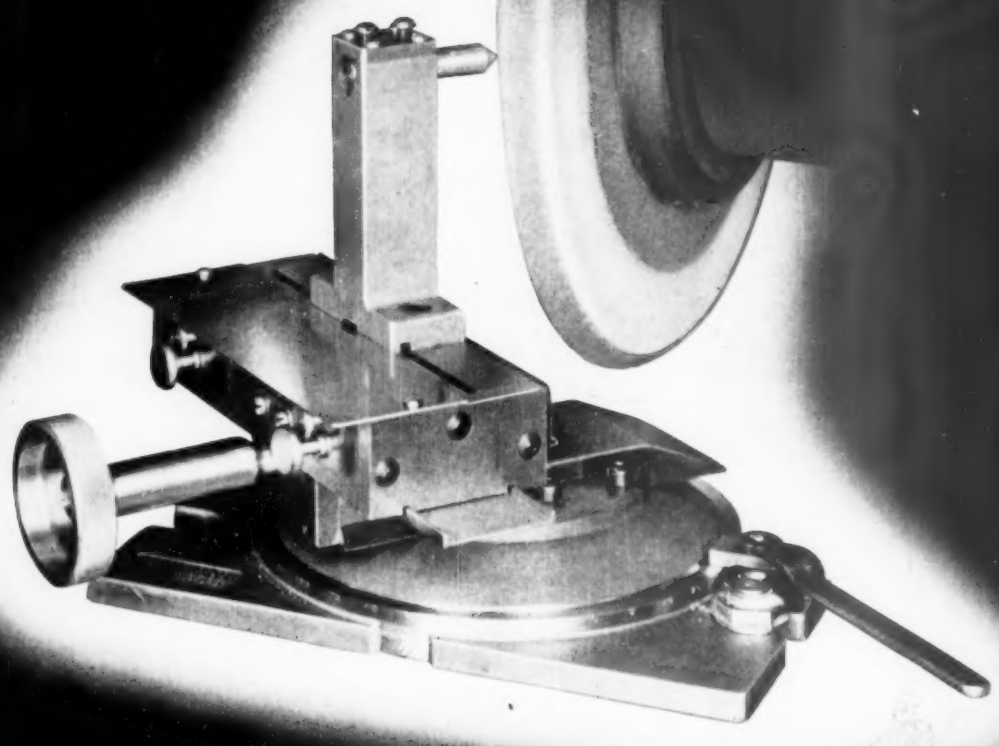
MORE PRODUCTION PER MAN-HOUR

More production per man-hour is being obtained in war plants using Niagara Power Squaring Shears. Convenient operation, quick, accurate setting of ball bearing self-measuring parallel back gages, full visibility of cutting line, instant-acting Niagara sleeve clutch are some of their modern features. Built in a complete range of capacities and sizes.



NIAGARA MACHINE & TOOL WORKS
637-697 Northland Ave., Buffalo, N. Y.
DISTRICT OFFICES: Detroit; Cleveland New York

ACCURATE DRESSING TO WITHIN .0001



THE VINCO ANGLE TANGENT TO RADIUS DRESSER incorporates the basic patented principle of dressing radii, angles and angles tangent to radii on abrasive wheels from the same axis without moving the diamond. It provides a fast accurate method of meeting every forming requirement in dressing operations. Adaptable for use on external, internal, cutter and surface grinders. Saves time and expense.

VINCO

PRECISION GAGES AND TOOLS

8555 Schaefer Highway, Detroit, Michigan, U.S.A.

A. S. T. E. DOINGS . . . . . .

Baltimore

Mr. Peter Rossman, Chief Developments Engineer of the Curtiss-Wright Corporation, Buffalo, was the principal speaker at the December meeting of the Baltimore Chapter which was held at the Engineer's Club on December second.

Mr. Rossman discussed "Processing of Aircraft Stampings." His talk was illustrated.

Another guest at this meeting was Adrian L. Potter, National Executive Secretary of the A. S. T. E. Mr. Potter presented Chairman Godfrey Steiner with a Chairman pin.

Praise was given Fred Bruggman, Meetings Chairman of this Chapter, for the attendance and interest shown by those at the meetings this year.

Bridgeport (Fairfield County)

Chairman, Thomas Fish, presided at the November 11th meeting of this Chapter which was held at the Connecticut Tool & Engineering Company's Building.

Mr. V. H. Ericson, service engineer of the Norton Company at Worcester, Massachusetts, spoke before the 95 members and friends attending. Mr. Ericson spoke on the process of the manufacture of abrasive wheels and also showed a motion picture illustrating this process. He also showed another picture illustrating the various types of wheels used in the resharpening of different types of cutting tools.

Luncheon was served to the group through the courtesy of Mr. Daniel Williams, president of the Connecticut Tool & Engineering Company.

Buffalo

National President of the A. S. T. E., Otto W. Winter, addressed the November 19th meeting of the Buffalo-Niagara Frontier Chapter which was held in the Lafayette Hotel. Mr. Winter talked on "Women in Industry."

Coffee speaker for this meeting of 105 members and guests, was Martin H. Kuehn, Director of War Training Program, Buffalo, whose topic was "Training and Equipment."

Elmira

Guest speaker for the December 7th meeting of the Elmira Chapter

(Continued on page 148)

A "TALENT SURVEY" TO CONSERVE BRAINPOWER

• TOOL ENGINEERS are contributing greatly to the War Effort. Their work is enjoying increasing recognition from industry. Ranking officers in the services are praising the efforts of American Society of Tool Engineers' members. Government branches are lauding the increased production and improved designs directly attributable to tool engineers.

Col. Earl McFarland, Commanding Officer at the Springfield Armory, summed it up this way: "I feel that no single group in the entire United States has done as much to forward the productive War Effort as have the tool engineers of this country." The same can be said, I know, of tool engineers in Canada. Tool engineering is now recognized as a profession. "There is strength in Unity." Your strength and value has been increased many fold by unity with fellow tool engineers in and through the Society. You have already displayed a unity of purpose, unity of work, unity of mind and unity of design.

But more can be done if we continue to act in unison. Soon you will receive a copy of the "Talent Survey," approved by the Board of Directors. Purpose of the Talent Survey is to give you an opportunity to do still more. Today, every war agency is confronted by problems of production and design. Many of the answers must come from tool engineers. Frequently it takes more time to find a man who can answer a problem than it takes him to answer it.

To help solve this problem is the purpose of the Talent Survey. The questionnaire which you may fill out will be sent to your local Industrial Relations Chairman as part of a reference file to help locate men quickly who can best solve problems as they arise in your territory. Likewise if you or your company have a knotty problem to answer, you may contact your Industrial Relations Chairman and he may locate a tool engineer whose questionnaire shows that he is qualified to solve your problem.

If conditions warrant it, the Industrial Relations Chairman of a Chapter may organize a committee or staff of selected engineers to consult on the problem and arrive at a solution. These staffs will be called ADVISORY STAFFS OF TOOL ENGINEERING.

Men on these committees will be selected from the local files for the problems of the moment and will not form a permanent staff. Members of a staff will act voluntarily—there is nothing compulsory about it—but it is believed that every red-blooded tool engineer will gladly co-operate with war agencies who may need help in increasing production, improving products or substituting less strategic materials.

Let's get together and act in unison. This is our War, a war to preserve Democracy which permits us freedom to act and speak as we see fit with our fellow man individually and in Unity.

Fill out your chart completely in duplicate. The duplicate will be held in Detroit in your personal file in case the master copy held by your local Industrial Relations Chairman is misplaced.

Fill it out at once and be sure you follow the instructions sent with the Talent Survey. If you have any questions, phone your Industrial Relations Chairmen. After filling it out, mail it without fail in the accompanying envelope. Your own company may be the first to benefit from the work of this Talent Survey. We must save Manpower. Let's save Brainpower too.

By saving Brainpower I mean, let's not duplicate effort. If you need help, go to your local Industrial Relations Chairman and ask him to contact someone who may help you. Then, be willing to help the other fellow if the Industrial Relations Chairman calls on you.

Your National Officers have trained the sights on the enemy. It's up to you to pull the trigger. Yours for Victory.

Earl V. Johnson
National Industrial Relations Committee Chairman
American Society of Tool Engineers

AMERICAN SOCIETY OF TOOL ENGINEERS, Inc.

2567 W. GRAND BOULEVARD, DETROIT, MICHIGAN

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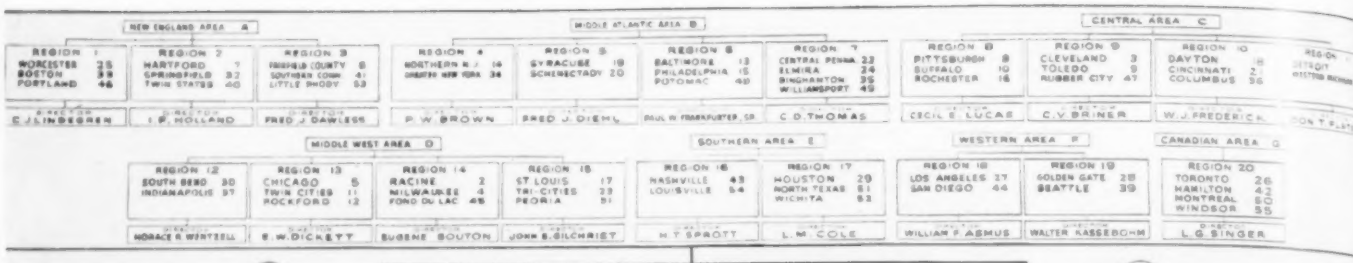

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DAVIS ROTOMATIC HIGH PRODUCTION MACHINERY

The young ladies pictured above, Frances, Arlisle, Pearl, and Virginia Felten, make up a musical quartette that entertains at Fond du Lac Chapter Meetings. Below are the words and music of an A.S.T.E. song composed by the quartette.

was Mr. Paul H. Miller, chief engineer of the Carboloy Company of Detroit. "The Grinding of Tungsten Carbides" was the subject of Mr. Miller's talk and was augmented with slide films.

95 members and guests enjoyed a "Dinty Moore" supper. Dinner music was furnished throughout the meal by the Parks Swan Trio.

Fond du Lac

The December 11th meeting of the Fond du Lac Chapter was held in the Civic Room of the Hotel Retlaw.

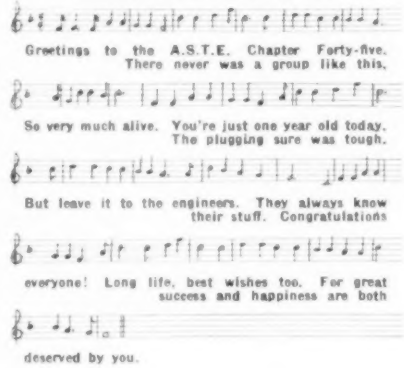
After a short business session, Chairman K. F. Gallimore introduced H. E. Mack, vice president of the LaSalle Steel Company, Chicago. Mr. Mack introduced the speaker, John Staiger, metallurgical engineer for the LaSalle Steel Company. Mr. Staiger presented a non-technical paper on the "Story of Steel Making from Ore to the Cold Finished Steel Bar." The paper was prepared by the speaker and presented for the first time at the Fond du Lac Chapter meeting.

Hamilton

Approximately 100 members and friends attended the December 11th meeting of the Hamilton Chapter held at the Welland House in St. Catharines. They heard an interesting technical paper on broaching in war industry, which was given by Fred Schytte, chief engineer, Canada Illinois Tools, Toronto. Mr. Schytte, vice chairman of the Toronto Chapter, used a series of slides to illustrate his talk.

In place of the coffee talk, the film produced by Past President Frank Curtis on "Induction Hardening of Machine Parts" was shown. Before the meeting closed, Mr. Len Singer, recently elected Regional Director, gave a brief summary of matters dealt with at the semi-annual meeting.

A.S.T.E. BIRTHDAY SONG


Greetings to the A.S.T.E. Chapter Forty-five. There never was a group like this,
So very much alive. You're just one year old today. The plugging sure was tough.
But leave it to the engineers. They always know their stuff. Congratulations
everyone! Long life, best wishes too. For great success and happiness are both
deserved by you.

SAVE THESE DATES!
March 25 - 26 - 27, 1943
for the
ANNUAL MEETING
AMERICAN SOCIETY OF TOOL ENGINEERS
MILWAUKEE, WISCONSIN

●

MARCH 25 (All day)
Board of Directors Meeting and election of officers

MARCH 25 (Evening)
FIRST TECHNICAL SESSION

MARCH 26 (Morning, Afternoon, Evening)
Technical Sessions

MARCH 27
(Morning) Technical Session
(Afternoon) Clinic for Chapter Officers and Committee Chairmen
(Evening) Annual Banquet

Committees and other details will soon be announced.

●

Let's keep ahead of developments . . . progress in TOOL ENGINEERING is rapid . . . here you will learn the latest technic in design, materials, training, and other phases so important to our field of activity.

●

SAVE THESE DATES
MARCH 25 - 26 - 27, 1943

Hartford

The Hartford Chapter held its regular monthly meeting on December 7th at the Hartford City Club, which has been adopted for the rest of the season as the meeting place for both dinner and technical gatherings.

Main speaker of the evening was Mr. A. Williams, general manager of the Haydon Manufacturing Company of Forestville, Connecticut. Mr. Williams gave an interesting talk on the subject, "Tooling For Greater Machine Output Through Work Simplification." Over 200 were present to hear Mr. Williams, who, as a pioneer student of methods and motion study, pointed out how lost motion and unused functions can be converted into increased production.

The 125 people present for the dinner heard Mr. Frank W. Curtis, immediate past president of the A. S. T. E. give a short coffee talk and saw his movie on Induction Hardening. Vice chairman Carl Moeller conducted the meeting in the absence of Chairman Hauck.

Indianapolis

G. B. Berlien, Chief Engineer of the Lindberg Engineering Company of Chicago, was the main speaker for the December 17th meeting of the Indianapolis Chapter. Mr. Berlien spoke on "Commercial Heat Treating" and illustrated his talk by a 16 mm sound film on Heat Treating Hints.

The 126 men at the dinner represented 22 industrial plants in the Indianapolis area. More than 150 attended the technical session and it is reported that there has been an enthusiastic response to the meetings of this Chapter.

National executive secretary, Adrian L. Potter, was a guest at this meeting.

J. H. Hoopwood, chairman of this Chapter, is on a special assignment with Lucas-Harold Corporation of Indianapolis, which is working on Naval Ordnance contracts.

Los Angeles

Some 300 members and guests made

(Continued on page 149)

The December 12th meeting of the Los Angeles Chapter, which was held in the Rainbow Isle Room of the Hotel Mayfair, an outstanding one in the history of the Chapter.

Mr. J. R. Wood, Manager of the Keystone File Sharpening Company was the coffee speaker for the evening and talked on the salvaging of hand files.

Mr. Glenn Woods, chief engineer and works manager of the J. C. Joyce & Associates Co. of Los Angeles spoke on "Hand Tool Design and Production." Following Mr. Woods talk, a sound film was shown from the office of War Information entitled "Ring of Steel."

A floor show with several vaudeville acts was included in the evening's entertainment.

Minneapolis-St. Paul (Twin-Cities)

The executive committee of the Twin Cities Chapter of the A. S. T. E. met with Director E. W. Dickett at the Curtis Hotel in Minneapolis on Sunday morning, December 6th. Mr. Dickett presented suggestions concerning the operation of the Chapter. Items of business to come before the next meeting of the board of directors were discussed.

New York

Mr. E. V. Flanders, manager of the Thread Grinding Department of the Thread Tool Division of Jones & Lamson Machine Company, Springfield, Vermont, was the speaker at December 17th of the New York Chapter meeting which was held at the New Yorker Hotel. Mr. Flanders spoke on "Modern Developments in Thread Grinding."

Also included on the program at this meeting was a motion picture shown by the Van Norman Machine Company on "Induction Hardening of Machine Parts."

Philadelphia

A Christmas party which included a floor show and numerous door prizes was the feature of the Philadelphia Chapter's December 17th meeting which was held at the Engineer's Club.

At the business session of this meeting, regional director P. W. Frank-

(Continued on page 150)

W-S Standard Reamers with carbide tips. Tapered shank (illustrated) and straight shank types. Sizes: ¼ to 1½.

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available from stock

REAMERS and many other cutting tools formerly in the "special" class are now STANDARD with us. The majority of these STANDARD cutters is in stock *most of the time.* Our broad line often enables the consolidation of tool orders and saving of valuable time. Each W-S tool is genuine CARBOLOY tipped. The grade used is the one best suited to do a cutting job on the metals for which the tool was ordered. (Other brands of carbide can be specified.)

Carbide tipped tools are not just a specialty with us . . . we make them *exclusively.* You can *expect* and *get* uniform, high quality results with W-S tools. Write for new FREE Catalog 942 and latest prices. WENDT-SONIS COMPANY, HANNIBAL, MISSOURI.

SAVE TIME . . . wire or phone your requirements!

W-S Carbide Tipped Core Drills available in straight and tapered shanks. Sizes: ½ to 1½.

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CENTERS • DRILLS • CORE DRILLS • COUNTERBORES • SPOT FACERS
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furter, Sr. gave a thorough report of the activities of his office. This was followed by the presentation of a ruby pin and four diamond pins to the present Chairman, Mr. Charles Crook, Jr. and four past chairmen.

The coffee period featured a motion picture entitled "Unfinished Rainbows" sponsored by The Aluminum Company of America.

Pittsburgh

The December 4th meeting of the Pittsburgh Chapter was held at the Fort Pitt Hotel with 45 members attending the dinner and 53 attending the meeting.

Mr. Ray Morris, National First Vice President, was a guest at the meeting and spoke about the service rendered to the membership by the Society. He stated that the National office, in furtherance of this service, will send to each member a talent survey form. The record thereby obtained of each member's ability and scope of service can be used to further the nation's war effort and also furnish opportunities of maintaining vocational stability in the post war period.

Mr. Adrian L. Potter, National executive secretary, was also a guest at this meeting and gave a survey on the growth of the Society.

Portland

Chairman Ned Andrews presided at the October 9th meeting of the Portland Chapter. A tribute to the memory of vice chairman Joe Perry, who died September 13th, was given at this meeting. Mr. Perry was one of the organizers of the Portland Chapter.

During the business session at this meeting, Mr. R. E. Goldsmith was selected to fill the office of vice chairman for the fiscal year 1942-1943.

Speaker of the evening was Ensign Harold A. Miller, Superintendent of Police for the T. B. I. and South Portland Yards. Ensign Miller gave a complete picture of the progress of the tool yards from the time construction was started up to the present. Ensign Miller also told of some of the police problems in connection with his work.

Rochester

The coffee speaker at the December 9th meeting of the Rochester Chapter, which was held at the University of Rochester Todd Union, was Mr. Francis K. Remington, chief attorney of the Rochester District Office of Price Administration. Mr. Remington told briefly the purpose, function, enforcement, and expectations of the O. P. A.

Adjourning to the Lower Strong Auditorium, Chairman Sears introduced Mr. Adam Gabriel, vice president of the Acme Industrial Company. Mr. Gabriel spoke on "Light Waves and their use in Precision Measurements."

Rockford

Edward F. Borro, engineer of the Durez Plastic and Chemical Company, spoke at the December 3rd meeting of the Rockford Chapter. Mr. Borro spoke on "The Design and Application of Plastics." 200 members

(Continued on page 152)

In this day of urgent manpower d, we must not overlook the rates" within our own plants that down manpower. Improperly de- ed machines, need for new tool- , bad plant layout, inadequate duction control systems, are but a of the common manpower pirates can keep you from achieving r greatest possible production effi- cy.

The immediate job of every plant ager is to make sure that em- ees and machines alike are used he maximum of their possibilities. helping to achieve the utmost iency from men and machines is tly the job that La Salle engineers very day.

La Salle engineers have helped y great American companies uglas Aircraft, Boeing, Curtis- ght, Allis-Chalmers, Fairbanks Morse, etc.) with all kinds of production problems—from quickly supplying temporary aid to their own overloaded engineering departments, to a complete job of tooling, processing, designing and even the purchasing of tools, on through to setting them up and starting production.

◆ Frequently, we are called upon to streamline plant layouts, make time studies, establish new cost controls, and to develop better incentive programs. No matter what your production problem is, you'll find La Salle competent to give you immediate and effective aid—eager to help you throw out "manpower pirates." All you need do is write, wire, or phone us today.

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For Duplicating Multiple Dies and Molds from Originals

For Light Production Milling—Tool Work—Jig Boring

MODEL 8-D

...all size. Working ...face 14" x 10". ...spindle speeds, 700-...000 rpm.

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Medium size. Working surface 17"x12". Two-speed motor, 20 spindle speeds, 250-6,000 rpm.

MODEL 9-J

Large size. Working surface 18½" x 15". Two-speed motor; 14 spindle speeds, 250-4,000 rpm.

MODEL 8-D

Small size. Ram type, movement 10". Table travel 10" x 16". 1-hp. spindle drive.

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Medium size. Ram Type, movement 12". Table travel 10" x 20" 1½-hp. spindle drive.

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Large size. Ram movement 12". travel 11" x 24" spindle drive.

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4 METHODS— the *Right* Method for any REPRODUCTION JOB

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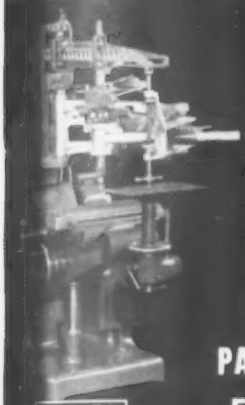
WIDE RANGE OF WORK from PIN POINTS TO BIG DIE BLOCKS — 3Ft.



Large size. Operates cutters up to ⅜" diam. For heavy 3-dimensional cutting of any shape or contour.

GORTON PANTOGRAPH ENGRAVING MACHINES

3-DIMENSIONAL
For Reproducing
Intricate Dies from Models

MODEL 3-L

Small size. Operates cutters up to 5/16" diam. An accurate highly sensitive tool; cuts characters down to 1/64" high.

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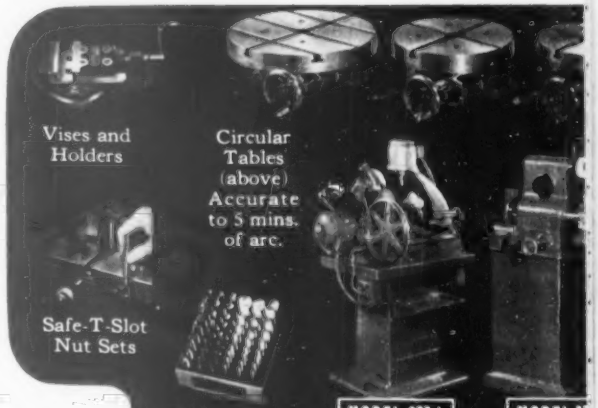

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MODEL 687-J Graduating Machine

MODEL J... Cutte... Grind...

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Small size. Operates cutters up to 5/16" diam. For small, light work—flat or uniformly curved.

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Munitions Engraver. High production at a minimum cost. For gun parts, dials, plates, scales, etc.

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Name Title

Company

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1322 RACINE STREET, RACINE, WISCONSIN, U. S. A.

and guests attended this meeting, and in addition to the talk on plastics, saw a movie entitled "Magic of Modern Plastics." Leo Reuland was the program chairman.

St. Louis

Mr. R. P. Koehring, Metallurgist of the Moraine Products Division of General Motors was the guest speaker at the December 3rd meeting of the St. Louis Chapter. Mr. Koehring spoke on "Powdered Metals in Machine Design."

The main item of business to be conducted was plans for this Chapter's annual Christmas party to be held on December 26th at the Norwood Hills Country Club.

J. E. Gilchrist, regional director of Region 15 attended this meeting.

San Francisco (Golden Gate)

A sound motion picture entitled "Building a tank" was one of the features of the November 10th meeting of the Golden Gate Chapter at the City Club Hotel in Oakland. Furnished through the courtesy of the War Department, this picture showed the production of a tank from start to finish, including machine operations, assembly lines, running test and firing of its armament.

Members and guests of this Chapter heard Mr. Newt Harris, district manager of the National Twist Drill Company give a talk on "Recent Drill Developments and Research."

Schenectady

The December 10th meeting of the Schenectady Chapter was held at "Ten-O-One" Veteran's Memorial Hall, Scotia, New York.

40 members were present and heard Mr. W. R. Scott, engineer of Ampco Metal, Inc. give a talk on the various types of bronzes together with their properties and application in industry. This talk was illustrated with slides.

Mr. F. J. Diehl, regional director of the Society gave a report at this meeting. First vice chairman, N. Y. Coxe, told of the program for the coming meeting for this Chapter.

Seattle

The December 8th meeting of the Seattle Chapter was held at Crawford's Sea Grill. Those introduced at this meeting included Mr. Klein of Vascoloy-Ramet, Mr. Ray Mack of Carboloy, Ensign Brisson, of U. S. Navy, Portsmouth Navy Yard and Mr. Crockett of the Boeing Aircraft Company. Ensign Brisson spoke briefly on tool conservation. Mr. Ken Bergerson, Chapter treasurer, who has been in Portland for about four months, mentioned briefly his experiences there at an aircraft plant.

Mr. Sampson of Allegheny-Ludlum talked on the necessity for an adequate tool steel designation system and suggested a method which was also being considered at the Boeing Aircraft Company.

South Bend

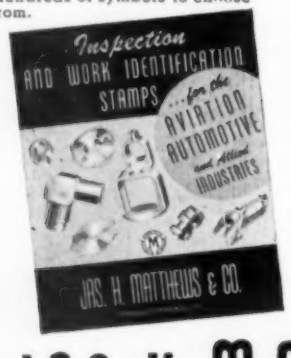
The tool engineers of the South Bend Chapter saw an excellent movie on the production of Bessemer steels at their December 8th meeting. They

(Continued on page 154)

ETCHING STAMPS *for* CODE MARKING
NOW MADE IN AN
Amazing New Material

Results of tests in actual production have shown that Matthews new "S-22" Synthetic outlasts the best rubber or other synthetic stamps from three to four times! The new "S-22" Synthetic is unaffected by acid etching inks.

Part marked with code symbols, by means of etching stamps. Hundreds of symbols to choose from.



Etching stamps are widely used for inspection stamping of metal parts and assemblies. Made in various styles to suit your marking application. The popular Peg & Pin Style illustrated is used where large volume inspection stamping is required.

Write for Bulletin S-Catalog 146

This valuable leaflet illustrates and describes the various styles of stamps available in the new "S-22" Synthetic. Write for your copy today!

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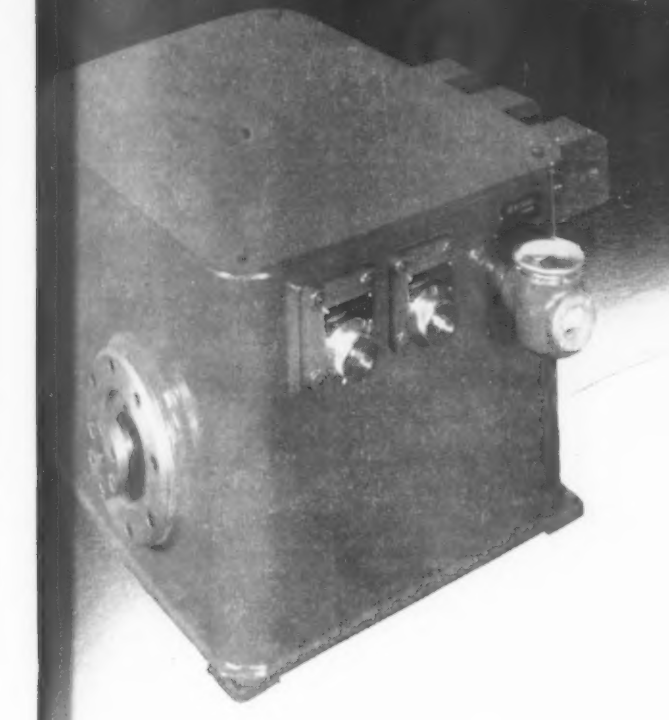
HYDRAULICS



The power unit illustrated controls six cylinders on a special contour milling machine—four of which are rapid traverse feed and return . . . two are for clamping. The unit provides a complete automatic machine cycle controlled by push buttons and limit switches, which in turn actuate solenoid operated valves. Feed rates are infinitely adjustable throughout the range of the feed control valves.

There are "HY-MAC" Hydraulic Power Units that may be applied to grinding, milling, boring, drilling, piercing, riveting, pressing, etc. . . . it is merely necessary to establish the functions of the machine that are to be hydraulically operated—and our engineers will recommend a Power Unit and a layout of the circuits to best do the job . . . Hydraulics are completely adaptable to any motion desired—for feed and traverse of multiple or single tools . . . for indexing and locating . . . for clamping, etc., all or any of the movements and in any combination. . . . Any designer or builder of machines can adapt their specific design, either partially or completely to "HY-MAC" HYDRAULICS . . . . . .

Our engineers will be glad to make recommendation and preliminary proposal without obligation.

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also heard a lecture in connection with this movie which was delivered by M. R. N. McGee of Jones and Laughlin Steel Corporation at Pittsburgh, Pa.

It was explained to the members present that the Army and Navy specifications Dept. had relaxed their restrictions on the use of Bessemer steels in the War Production Program, thus opening a large new source of materials available.

Chapter chairman, Stanley Cope, presided and gave the members and guests a brief summary of his recent inspection tour of the Southwestern industrial districts of the United States.

Springfield (Twin States)

Approximately 160 members and guests enjoyed the General Electric film, "Railroadin" which was shown following a turkey dinner at the December 10th meeting of the Twin States Chapter.

The speaker of the evening was Mr. T. D. MacLafferty, New York District Manager of the Carboloy Company. Mr. MacLafferty outlined the steps through which the educational program of the Carboloy Company had developed. He showed one of a series of six instruction films which have been produced. In addition the speaker sketched a number of typical carbide applications on the blackboard and discussed them.

Springfield, Mass.

More than 300 members and guests, including a number of Springfield leading industrialists, were present at the annual dinner meeting and executives night of the Springfield Chapter, which was held December 14th at the Kimball Hotel. Dr. Allan A. Stockdale, representing the National Association of Manufacturers, was speaker of the evening and talked on "Tooling for Victory." Lt. Robert Prouty of Springfield spoke briefly of his experiences as an aviator in the South Pacific. James Y. Scott was the toastmaster for the occasion.

Toronto

The December meeting of the Toronto Chapter was a trip to see actual tool engineering applications at Canadian Acme Screw & Gear Company and its associate and neighbor, York Arsenals. More than 120 attended this meeting and had dinner which was served in the company cafeteria. Chapter chairman Norm Wearn is superintendent of the main plant. Members were welcomed by president N. E. Petersen and works manager Fred Adams.

Washington, D. C. (Potomac)

42 members and guests were present at the December 3rd meeting of the Potomac Chapter at the Harrington Hotel.

Mr. H. C. Cogan, chief engineer, National Electric Welding Machine Company, was the speaker at this technical session. Mr. Cogan spoke on "Jigs and Fixtures for Resistance Welding Machines." 75 members and guests attended the technical part of the meeting and took part in the question period which followed Mr. Cogan's speech.

(Continued on page 156)

Cuts Two 6" dia. Gear Blanks every 11 minutes

There are 12 MARVEL Saws at the Northern Pump Co., Minneapolis, some of which are in their tenth year of service. The Giant Hydraulic No. 18 MARVEL pictured above is a comparative newcomer in the Northern MARVEL family, having been installed just a few months ago, to speed up production on large work. When pictured, it was cutting-off gear blanks from 6" dia. S.A.E. 3120 hot rolled steel, two at a time, cutting-off two blanks every 11 minutes.

Whether you want thin slices or long lengths cut-off from flat or round bars, MARVEL Production Saws will produce more pieces per hour and will cut them off at lower cost per piece than any other type saw. Included in the MARVEL System are small inexpensive dry-cutting shop saws; heavy duty all-ball-bearing high speed hack saws (the fastest saws built); automatic production sawing machines that require no more operator attention than an automatic screw machine; a metal-cutting band saw that saves hours of machining, roughing to size and shape; and a Giant Hydraulic Hack Saw, that cuts the toughest steel with ease. MARVEL High-Speed Edge Hack Saw Blades are positively unbreakable, can be safely operated at maximum speed and feed on any hack sawing machine.

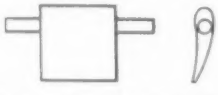
Buy from your local distributor

ARMSTRONG-BLUM MFG. CO.
"The Hack Saw People"
5700 BLOOMINGDALE AVE. CHICAGO, U. S. A.
Eastern Sales Offices: 225 Lafayette St., New York

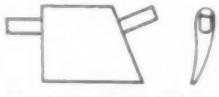
HOLLOW MILLING

SOME OF THE TYPES OF TURBINE BLADES THAT CAN BE MACHINED ON THIS LeMAIRE HOLLOW MILL

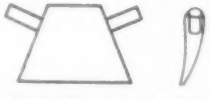
PLAIN END—
STRAIGHT TRUNNION



TWO STRAIGHT TRUNNIONS



ONE TRUNNION STRAIGHT
—ONE ON ANGLE



TWO TRUNNIONS ON ANGLE

BLADE WITH CONCAVE END

THE DEVELOPMENT OF THIS SPECIAL MACHINE MORE THAN DOUBLES THE NUMBER OF TURBINE BLADES THAT CAN BE HOLLOW MILLED

This, like all the other production machines that leave here every few days, was engineered and built by us to meet a specific requirement.

This machine is used for hollow milling a round trunnion at each end of a turbine blade and at the same time face the blade to length. Its performance is highly praised for it is machining over twice as many turbine blades as the old method did.

It operates with four stations (although the job described above requires only three).

Protractor and Vernier scale permits cutting heads to be set at various angles, thus widening the scope of shapes that can be machined.

This is only one of the many types of special machines we have been building. We have engineered and built other machines for such operations as boring, milling and drilling to meet specific needs. We solicit an opportunity to discuss your production problem.

LeMaire TOOL & MFG. CO.

2659 S. TELEGRAPH ROAD ▲ DEARBORN, MICHIGAN

ENGINEERS AND BUILDERS OF PRODUCTION MACHINES

1-BLADE BREAKAGES
2-REJECTIONS BECAUSE OF POOR FINISH
3-FIRE HAZARD MACHINING MAGNESIUM
4-EXCESSIVE TOOL COSTS
5-EXCESSIVE BLADE SHARPENINGS
6-DECREASED PRODUCTION FROM HAND GROUND TOOLS
7-PRODUCTION LOSS FROM FREQUENT SETTING OF TOOLS AFTER SHARPENING
8-SUPERVISION NECESSARY WITH INEXPERIENCED HELP WHEN GRINDING
9-SECOND FACING OPERATION NECESSARY DUE TO POOR FINISH OF CUT-OFF
IF THESE ARE Your PROBLEMS IN CUTTING OFF OPERATIONS

HERE ARE YOUR ANSWERS

Use Empire Tool Company's

LUERS PATENTED

Cutting-Off Blades

BECAUSE:

1 They are scientifically designed and made of material that will withstand shock and resist abrasion.

2 The hollow-ground top causes chip to collapse and thus pull away from sidewalls of cut so surfaces are of unusually fine finish.

3 A combination of proper and accurate machine-ground clearances contributes in successfully reducing friction to minimum.

4 Luers Blades have longer life; they are usable within an inch of their entire length.

5 The space created by the collapsing action of the chip in pulling away from the sidewalls allows the coolant to reach the cutting edges.

6 Being machine-ground accurately to definite standards, Luers Blades always possess the required uniform clearances.

7 Special Holder permits ease of blade removal and quick replacement in exactly same position without disturbing setup.

8 Grinding is simplified. Only front face of blade is ground. All other surfaces remain unchanged; constant clearance is maintained.

9 The free cutting action obtained through the collapsing of chip prevents chip binding on the face of piece being cut off. In most cases, this eliminates second facing operation.

Luers Patented Cutting-off Blades and Holders are produced by Empire Tool Company under license issued by John Milton Luers Patents, Inc.

BUY WAR BONDS

Send for copy of new complete catalog showing diagrams, sizes, and prices of blades and holders.

The Blades That Reduce Friction

EMPIRE Tool Co.

8776 Grinnell Ave. Detroit, Mich.

A. S. T. E. DOINGS

Mr. Adrian L. Potter, National Executive Secretary, attended this meeting and presented Chairman Seifret with a "Chairman" pin.

Wichita

The December 8th meeting of the Wichita Chapter was held at the Hotel Broadview. Vice chairman M. M. Ross presided at this meeting. A special request for a review of Mr. John Rick's speech of the previous meeting was given. Mr. Ricks illustrated his points, with sample parts made from the dies which he described in his previous talk on "Kirksite Lead Dies for Exhaust Stacks."

Mr. Hyne of the Beech Aircraft Company, gave a talk on the subject "Tool Co-ordination." as worked out in his plant.

Worcester

150 tool engineers attended the December 1st dinner of the Worcester Chapter which was held at Putman & Thurston.

This meeting did not include a technical session because it was the annual fun night for this Chapter. The entertainment Committee was headed by George B. Haire, Floyd Harris, Henry Merrill, Frank Robertson and Homer Libbey took part in the floor show which followed the dinner.

Columbus

The Crystal Room of the Hotel Fort Hayes was the scene of the December 15th annual Christmas party of the Columbus Chapter. Included on the program of this party were four reels of motion pictures entitled "A General MacArthur News Reel," "The Machinist and Tool Maker," "Jigs and Fixtures," and "Modern Football Fundamentals."

The speaker at this program was Paul O. Bixler, end and wing-back coach at Ohio State University. Mr. Bixler gave a talk on "Football as played at Ohio State."

Following this talk refreshments were served and a picture of the New York Giants football team was shown.

CHIPS FROM A. S. T. E. NATIONAL HEADQUARTERS

Regional Director C. J. Lindegren reports encouraging news from north eastern New England. Following a

(Continued on page 158)

"Know How" to do it Better - Faster... with

"LOGAN" AIR and HYDRAULIC EQUIPMENT

Designed to save time, effort and motion, "LOGAN" Air and Hydraulic Equipment has solved production problems and speeded up manufacturing in the leading industrial plants of the world. Easily adaptable to all types of production machines, thousands of uses have been found to do the job "better and faster" with "LOGAN" Equipment. The line is complete and includes Air and Hydraulic Control Valves, Rotating and Non-Rotating types of Air and Hydraulic Cylinders, Air and Hydraulically Operated Chucks, Hydraulic Power Units, Relief and Reducing Valves, Presses, Vises, "Sure Flow" Coolant Pumps, etc. "LOGAN" Engineers will be glad to make recommendations on your requirements — or write for any of the catalogs or bulletins shown.

LOGANSPORT MACHINE, Incorporated

902 Payson Road Logansport, Ind.

Do You Know When to Use This **KNIFE** *and* **FORK?**

A Knife File and a Fork File . . . Swiss-Pattern . . . each have many applications in tool room and machine shop.

The extremely narrow wedge section of the Knife File, with double cut on both flat sides, and single cut on edge and back, make this file suitable for use where acute angles are to be filed.

The rectangular section with rounded edges of the Fork File, and its double cut all over, adapt this file to many general uses where a file with rounded edges is better than a file with sharp edges.

These are but two of the 44 different shapes of Swiss-Pattern Files which you can obtain from "American Swiss". For best results in your intricate and precision filing work, write for the American Swiss Catalog which shows the most suitable file for each job.

MORE THAN 3000 SHAPES, CUTS AND SIZES

Cuts Nos. 00, 0, 1, 2, 3, 4 and 6

Hand	Pippin	Half Round (Coarse Cut)
Pillar (Regular)	Crochet	Flat (Coarse Cut)
Pillar (Narrow)	Round	Mill
Pillar (Extra Narrow)	Square	Mill (2 Round Edges)
Half Round	Three Square	Finishing
Slim Half Round	Metal Saw	Round Edge Joint
Half Round Ring	Slitting	Square Edge Joint
Crossing	Checkering	Die Sinkers
Knife	Parallel Round	Needle
Warding	Coil or Point	Escapement
Equaling	Taper Saw	Machine
Barrette	Slim Taper Saw	Die Sinkers' Rifflers
Cant		Silversmiths' Rifflers

FREE CATALOG
SENT ON REQUEST

American Swiss File & Tool Co., Elizabeth, N. J.

FILES ONLY THE BEST ARE GOOD ENOUGH TOOLS

AMERICAN SWISS
SWISS PATTERN FILES

visit to the Portland Maine Chapter. John Lindegren notified the National Office of some unusual distances travelled by those attending meetings of that Chapter. He says, "For instance, John Johnson of Oxford Paper Company at Rumford drives 87 miles to a meeting and never has missed one yet. Fred Lindsey, Mechanical Superintendent of the Eastern Corporation, South Berwick, Maine, has to travel 153 miles each way.

* * *

Otto Stroh drives 50 miles each way from Dover, New Hampshire but the award (if there was one would probably go to Tom Barker who travels 225 miles each way to a meeting from Derby, Maine and returns home on the sleeper. This shows real interest in the program of ASTE.

Bramson Publishing Company Photo

MARY A. STOUT

Working on membership reports

This is Mary A. Stout another of the smiling young ladies at the National Office. Miss Stout is Secretary to Frank Quigley, Membership Supervisor. This is really an action photo for she is busy cutting stencils for one of the numerous membership reports which go out of the office each month. Speaking of membership reminds the Chipper that growth of the Society this year has been at a rapid rate. A report recently issued indicates that the membership at the beginning of the year was 8,239 and on December 6 had reached a total of 11,947. This is an increase of 3,708 in eleven months or an average of 337 per month. Who was it that said that American Society of Tool Engineers is a rapidly growing organization? If you could sit in the office with Miss Stout and see the amount of work which goes into the checking of an average of more than ten applications for

(Continued on page 160)

WHEELS of PROGRESS *for 1943*

GRINDING WHEELS,

now more than ever, demand the most careful selection. Conservation should be the ever-watchful password in every foundry, toolroom, factory grinding department or machine shop.

We are at your command day and night, to make certain that of the hundreds of grit — hardness grade — and porosity combinations, your selection will be the one that will give you a greater and more rapid production with the maximum amount of grinding efficiency at a minimum cost.

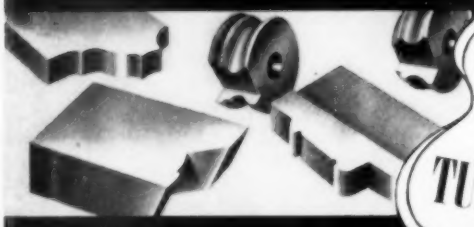
BAY STATE WHEELS of PROGRESS

CONTROLLED POROSITY, FRACTIONAL GRADES, H9 VITRIFIED BOND, three of our many outstanding features, assure a definite start in this direction. Consult BAY STATE and be sure!

BAY STATE

ABRASIVE PRODUCTS CO., WESTBORO, MASS. U.S.A.

Do You Encounter Difficulties In GRINDING FORMS Such As These In TUNGSTEN-CARBIDE?



Here Is The Machine That GRINDS EVERY DESIRED PROFILE *Directly From The Drawing*

The Wickman Optical Form Grinder will finish grind any desired regular or irregular shape within its range. It will grind flat or circular form tools, punches and dies, profile gages, templates and many other irregular parts to the highest degree of accuracy. A number of thin pieces can be ganged together, permitting exact duplication of small quantities of precision parts.

The machine employs a layout 50 times the size of the profile to be ground and a microscope. The microscope is carried on the short arm of a 50:1 pantograph. The long arm of the pantograph carries a pointer which is moved along the line of the layout. The microscope which has cross hairs centered in a locating circle is focused directly on the work and grinding wheel. The intersection point of these cross hairs corresponds to the position of the pointer on the long pantograph arm.

The grinding wheel is fed by hand to this point after each movement of the pantograph arm, and its exact position is observed through the microscope. As the long arm of the pantograph is moved from point to point on the layout, the intersection of the cross hairs moves correspondingly at the 50:1 reduction.

The machine is capable of reproducing all of the precision which is incorporated in the 50 times size drawing and observed through a microscope. An accuracy to within .0004" may be obtained, and reasonable care on the part of the operator makes closer limits possible. The wheel head is a separate unit and its operation is not controlled by the pantograph. Therefore, wheel wear does not affect accuracy. WRITE FOR FULL DETAILS.

WICKMAN OPTICAL FORM GRINDER

THE Wickman CORPORATION

15535 WOODROW WILSON
DETROIT, MICHIGAN

membership in each working day;—the amount of correspondence which is entailed in the investigation of those applications which do not contain complete information concerning the applicant and the correspondence resulting from applications from those who are not qualified for membership; you would realize that sometimes Miss Stout has no reason to smile.

* * *

President Otto Winter made a speech in Buffalo on November 19. Across the Chipper's desk to the time we go to press have passed 119 column inches of newspaper publicity about this speech which appeared in 20 newspapers, most of them dispatches by AP. I guess that this is real publicity for ASTE. Of course Otto talked about a most interesting subject, "Women in Industry."

* * *

There is a booklet published twice a month known as "VITAL SPEECHES." The policy of the publication is in part as follows: "The publishers *** believe that the important addresses of the recognized leaders of public opinion constitute the best expressions of contemporary thought in America—" ASTE has been honored through the publication in the Nov. 15 issue of "VITAL SPEECHES" of the presentation "Detroit Tools for War" made by Elmer A. Clark, Vice President of Budd Wheel Company and "Delivered at the War Production Conference, American Society of Tool Engineers, Springfield, Mass., October 17, 1942." These are orchids for Elmer Clark and recognition of the fact that ASTE has speakers of top-notch national interest. Others whose speeches appeared in the same issue included Winston Churchill, Henry A. Wallace, Vice President of USA and Hon. Sumner Welles, Acting Secretary of State.

* * *

Members of ASTE are still on the move. We had 303 changes of address during the month of November. We suggested that 56 members perhaps would like to transfer from one Chapter to another nearer to their present locations.

* * *

The National Industrial Relations Committee met with the Executive Committee at Detroit, Sunday, De-

(Continued on page 202)

ANOTHER NEW DEVELOPMENT IN CUTTING FLUIDS

STANICOOL H.D. SOLUBLE OIL

. . . to help you meet more of your war-born metal cutting problems.

Combines the cooling qualities of a water emulsion with the tool life and finish approaching that obtained with cutting oil.

AGAIN the farsighted planning of Standard Cutting Oil Engineers has solved a machining problem which has been troubling many manufacturers with war production work. On certain operations, and with some metals, such as stainless steel, it is difficult to get good finish and tool life with a conventional water emulsion; yet a cutting oil will not supply sufficient cooling to prevent overheating of the tool and work.

By working with some of the first manufacturers who faced this problem, Standard's Engineers developed a cutting fluid that has both properties—the cooling quality of an emulsified oil and the ability to give tool life and finish approaching that obtained with a good cutting oil.

This oil, Stanicool Heavy Duty Soluble Oil, won't take the place of all other cutting oils, but it may be the solution to some of your troublesome machining operations. Two typical jobs it is doing are briefly outlined below.

If you have similar operations or problems, call in a Standard Cutting Oil Engineer. He can help you test Stanicool H.D. or some of the other new cutting oils recently developed for the new steels, new tools, and new operations on which you are now working. Write Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago, Illinois, for the Engineer nearest you.

TYPICAL STANICOOL H.D. SOLUBLE OIL JOBS

STAINLESS STEEL SCREW

Job. Machining 18-8 stainless steel from ⅞ inch bar stock to size and shape of part illustrated.

Problem. Due to the extremely thin section of the screw head (approximately 1/32), more cooling was needed than cutting oils could give. A conventional emulsified oil did not give satisfactory finish in facing the screw head.

Result. With Stanicool H.D., overheating and burning of the tool was eliminated. The special compounding in Stanicool, which gives it a heavy duty quality comparable to a cutting oil, gave satisfactory finish even though this stainless steel tends to tear or smear in machining.

HARDENED STEEL PART ON MACHINE GUN

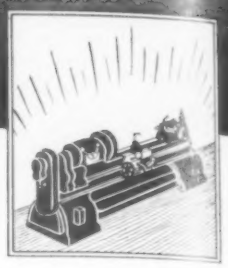
Job. Drilling and reaming one inch holes in ½ inch, 4340 hardened steel, machine gun part.

Problem. This would normally be a soluble oil job, but with a soluble oil the drills, striking hardened spots in the work, had to be reground after every 2 or 3 pieces.

Result. Sulfurized cutting oils and mixtures of various base oil blends with light mineral oil gave little improvement. Stanicool H.D. lengthened drill life from 2 to 3 to around 100 pieces per grind.

STANDARD OIL COMPANY (INDIANA)

NEW EQUIPMENT, Materials, Processing



T M REG U S PAT OFF

NEW BROACH SHARPENING MACHINE (J52)

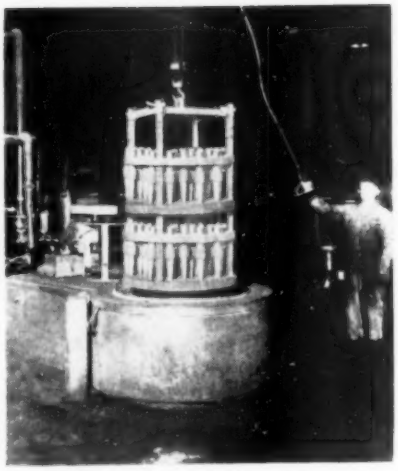
Designed to assist shops in doing their own broach sharpening, a new universal broach sharpening machine for either round or flat broaches has been recently announced by Colonial Broach Company of Detroit. Said to provide a rapid and accurate means of maintaining the same tooth forms and cutting effectiveness as are originally provided by the broach maker, this machine saves the time used in sending the broaches back to the manufacturer for sharpening.

> INFORMATION FREE
>
> **For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 163.**

The change-over from round to flat broach sharpening on this machine is said to be accomplished with few adjustments and without special tools. It is designed to accommodate flat broaches up to 65 inches in length between end teeth and round broaches up to 72 inches between centers and 6 inch overall diameter.

One feature of this new machine is the use of two hand wheels to provide three movements of the grinding wheel head and work table. One hand wheel moves the table to the right and left under the grinding wheel head. The other hand wheel has "In" and "Out" positions. "In" position controls the horizontal feed of the slide and grinding wheel head while the "Out" position controls the vertical movement of the grinding wheel head.

The machine has a broad rectangular base of cast iron, said to be rigidly constructed to avoid vibration. The ends are extended outward to provide a full-length support from the working table, which has an overall length of 99 inches. Table travels on one flat and one V-shaped way. Other construction features include 11½ inches wide working table and dust guards on ends.



Lindberg Heat Treating Furnace
Heating Capacity, 1750 degrees F.

HEAT TREATING FURNACE (J53)

Said to make possible a speed-up in hardening, annealing, normalizing, tempering, nitriding, and other heating operations, a new type of forced convection heat treating furnace has been recently developed by the Lindberg Engineering Company, 2444 West Hubbard Street, Chicago.

Called the Super Cyclone, this new unit is said to have a heating capacity of 1750 degrees F. Floor space is saved, the manufacturer claims, because forced convection heating permits the handling of work on fixtures or in work baskets rather than spreading the work on a hearth.

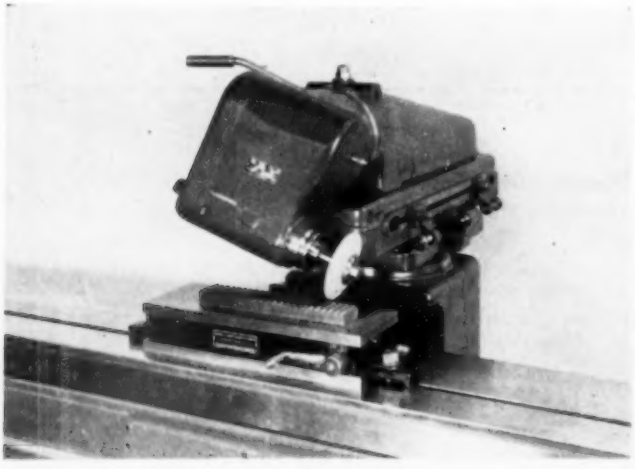
The accompanying illustration shows a fixture carrying 100 worm gears, weighing 20 pounds each, which is being removed from the work chamber of a Super Cyclone preparatory to quenching. The time required to heat the gears is 4 hours and they remain on the fixture through hardening, quenching, and tempering. The same operation with a different type of furnace is said to have taken more time because the maximum load was 30 gears. Both types of furnaces took the same floor space—8 by 11 feet.

PLASTIC SHIELDS (J54)

To conserve oil and protect the operator from the spray, a transparent guard of Lumarith plastic is now in use on automatic screw machines and turret lathes. Lumarith plastic is a product of Celanese Celluloid Corporation, Division of Celanese Corporation of America, 180 Madison Avenue, New York.

Keeping the oil within bounds and

(Continued on page 165)



Colonial Broach Company's New Broach Sharpening Machine
Makes broach sharpening possible in user's own plant.

Lumarith Plastic Shield for Protection Against Oil
Used on automatic screw machines and turret lathes.

FREE INFORMATION and SERVICE

Request the information and service you desire and keep your library up-to-date . . .

THREE FREE SERVICES . . . WITHOUT OBLIGATION

For your convenience, these three business reply cards enable you to request quickly . . .

1 New catalogs—bulletins listed in this issue.

2 Additional information or bulletins relative to new equipment—new materials or new processes.

3 When answering advertisements, specific information on problems or company representative's call.

HOW TO ORDER

Simply fill out the card, indicating the information or service you desire, and mail. Be sure to write, in the square, the identifying number of the catalogs or bulletins covering new products described. In answering an advertisement, include the name of the advertiser and indicate by a cross if literature is desired or if company representative should call. No stamp is required.

1

USE THIS CARD for requesting new catalogs and bulletins listed in this issue.

2

USE THIS CARD for requesting additional information or bulletins relative to new equipment, materials, processes, etc.

3

USE THIS CARD when answering advertisements, to obtain specific information on problems or when you desire a company representative to call.

Write in square, number of item describing one catalog wanted ➔ ☐

NAME

COMPANY

ADDRESS

TITLE

THE TOOL ENGINEER, JANUARY 1943

Write in square, number of item describing one catalog wanted ➔ ☐

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NAME OF ADVERTISER

☐ Literature ☐ Have Representative Call

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THE TOOL ENGINEER, JANUARY

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☐ Literature ☐ Have Representative

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THE TOOL ENGINEER, JANUARY

PAGE NO.

NAME OF ADVERTISER

☐ Literature ☐ Have Representative

NAME

COMPANY

ADDRESS

USE THESE FREE REPLY CARDS

They are provided for your convenience in requesting information and service . . . . .

FIRST CLASS
PERMIT No. 6691
(Sec. 510, P. L. & R.)
DETROIT, MICH.

BUSINESS REPLY CARD
NO POSTAGE STAMP NECESSARY IF MAILED IN THE UNITED STATES

2c.-POSTAGE WILL BE PAID BY—

THE TOOL ENGINEER
THE BRAMSON PUBLISHING COMPANY
2842 W. GRAND BLVD.
DETROIT, MICHIGAN

1

Request for:

NEW CATALOGS
BULLETINS
BOOKLETS

FIRST CLASS
PERMIT No. 6691
(Sec. 510, P. L. & R.)
DETROIT, MICH.

BUSINESS REPLY CARD
NO POSTAGE STAMP NECESSARY IF MAILED IN THE UNITED STATES

2c.-POSTAGE WILL BE PAID BY—

THE TOOL ENGINEER
THE BRAMSON PUBLISHING COMPANY
2842 W. GRAND BLVD.
DETROIT, MICHIGAN

2

Request for additional information and catalogs covering

NEW EQUIPMENT
MATERIALS
PROCESSES

FIRST CLASS
PERMIT No. 6691
(Sec. 510, P. L. & R.)
DETROIT, MICH.

BUSINESS REPLY CARD
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THE BRAMSON PUBLISHING COMPANY
2842 W. GRAND BLVD.
DETROIT, MICHIGAN

3

ANSWERING ADVERTISEMENTS

Requesting:

LITERATURE
REPRESENTATIVE TO CALL

sending it back to the drip pans for filtering and re-use, the plastic shield on the screw machine shown in the accompanying photograph was fabricated and designed by Kollsman Instrument Division of Square D Company at Elmhurst, N. Y. for use in their factory.

This plastic material is said to be crystal-clear and easy to keep clean, thus the operator can watch the work as closely as if the guard were not there. Light weight, flexibility, and ease of application are said to make it possible to install these guards with a minimum of expense and labor.

INFORMATION FREE

For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 163.

BORING MACHINE (J55)

The Federal Machine and Welder Company of Warren, Ohio, recently announced that they are assembling boring machines, which are used in turning out turrets and turret rings for tanks, in their plant at Mineral Ridge.

There are two different models of this machine, one with a capacity of 100 inches and the other with a capacity of 112 inches. Each machine is said to cover a floor space of 196 feet, is nearly 15 feet long, and weighs 110,000 pounds. There are approximately 750 parts in each machine, the largest weighing 23,000 pounds.

These mills are shipped under Government direction to the tank manufacturers of the United States and Canada.

AUTOMATIC INDEXING FOR TURRET LATHE (J56)

The Oster Manufacturing Company of Cleveland, Ohio, recently announced that their No. 601 "Rapiduction" lathe, previously equipped with manually controlled, six-station turret, is now equipped with automatic indexing.

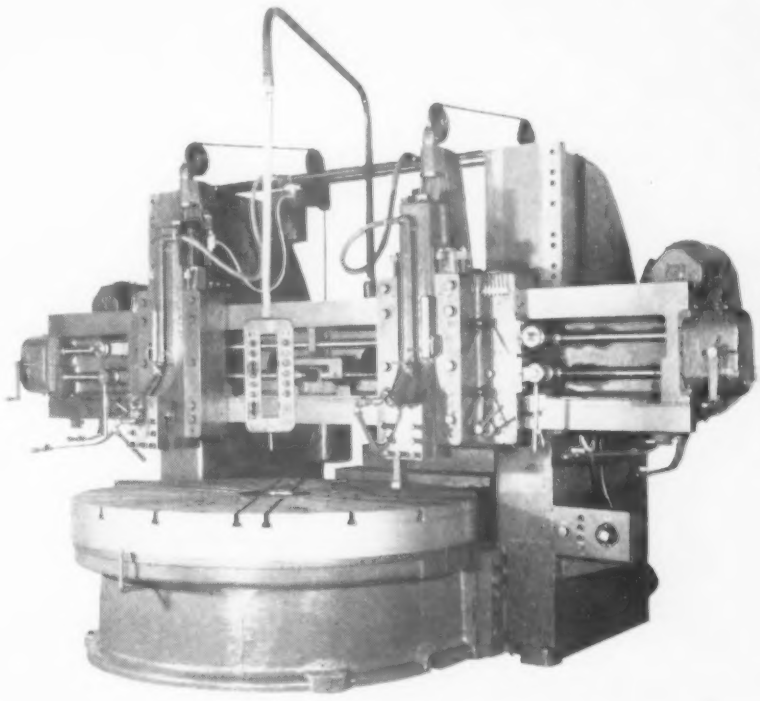
Having a capacity of 1½ inch (round) for cutting-off, boring, tapping, reaming, facing, threading, and other operations, this machine can be specified with a worm or direct drive to the spindle, a two-speed motor, reverse, electric brake control.

Said to be used to release more costly machines and highly skilled operators from a wide range of bar and chucking work, this machine lists among its features a spindle mounted on ball bearings, a coolant pump assembled in the machine base, and quick-change sheaves for speed changes.

SALT BATH FURNACE (J57)

Having an operating temperature of 1650 degrees F., a new electric pot-type furnace has been developed by H. O. Swoboda, Inc., 133 Thirteenth Street, New Brighton, Pa., for cyanide hardening of tool steel products. Trade-named the Falcon High Temperature Salt Bath Furnace, it is designed for production work and general shop heat treating and said to be suitable for regular thermal hardening as well as the

(Continued on next page)



The Federal Machine and Welder Company's New Boring Machine
Used for turning out turrets and turret rings for Army tanks.

Oster "Rapiduction" Lathe Now Features Automatic Indexing
Has a capacity of 1½ inch (round) on a variety of operations.

cyanide hardening.

The furnace is provided with throttling-type automatic controls which are said to permit the operation of the furnace at low temperatures for tempering. The furnace casing is of steel with an alloy pot which is suspended from the casing into the furnace chamber. It has a hinged, swinging-type cover.

Pot dimensions are 16 inches internal diameter by 18 inches deep. Capacity of the unit is 30 k. w., 220 volts, single phase current. It also can be connected for use on 3-phase current.

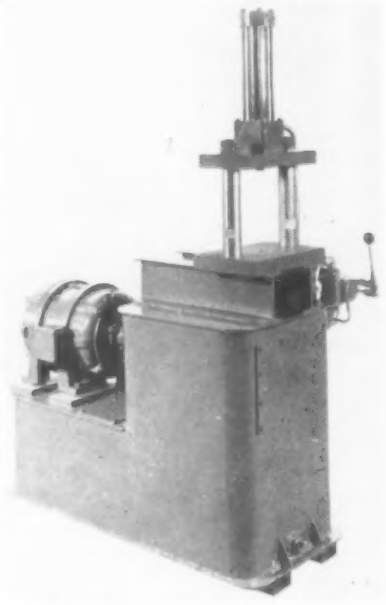
INFORMATION FREE

For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 163.

HYDRAULIC ARBOR PRESS (J58)

Rated at 6-tons with an 8 inch maximum stroke — 20 inches of daylight and an opening of 20 inches from left to right, this new hydraulic arbor press, recently announced by Hydraulic Machinery Inc., 10421 Grand River Avenue, Detroit, has a 75 inch overall height and is 34 inches from the floor to the platen.

The power unit and press are en-unit, the former, reinforced on the top by two I-beams, acts as the base for the assembly. The control centers at a lever-operated valve which determines the direction and the speed of the movement. It has a 3.4 ipm closing speed. Only a 27 by 42 inch floor space is occupied by the arbor press and power unit combined.



New Hydraulic Arbor Press
Has 8 inch maximum stroke.

The motor is directly connected, rates 5 hp on 3-phase 60 cycle ac., and operates at 1200 rpm. It is equipped with a manually operated four-way valve that is self centering and a gauge which registers from 0 to 2000 pounds pressure. A Vickers pump is standard equipment.

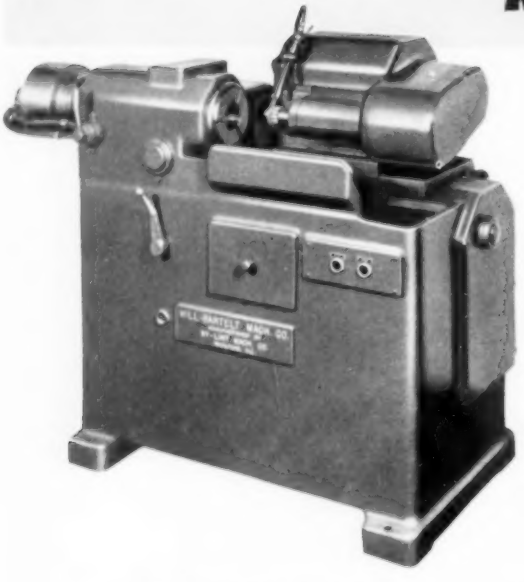
NEW SHELL COATING EQUIPMENT (J59)

Said to be designed for a wide adaptability in finishing operations, a new line of high speed, automatic shell coating equipment has recently been announced by The DeVilbiss Company of Toledo, Ohio. This equipment paints bombs, shell, shot, grenades, and cartridge cases in sizes ranging from 20 to 155 mm.

Though basically similar, each unit is engineered to do a specific job. For example, some types spray exteriors only, while others paint both inside and

(Continued on page 168)

TWO NEW
THREAD MILLING MACHINES



for SINGLE PURPOSE or GENERAL PURPOSE THREAD MILLING

IN THE DESIGN of these machines, the basic elements of both models are the same. All driving and control units are fully enclosed in a rugged and rigid structure. The spindle is 40″ from the floor and the machine requires only 42¼″ x 28″ of floor space.

The single-purpose model, shown here, is for cutting either R.H. or L.H. external or internal threads, using a multiple type thread mill and cam feed for an automatic feed cycle. The air-operated collet chuck can be made for work up to 3″ diameter.

The general-purpose model is for a much wider range of applications. A tilting adjustment on the cutter head permits cutting threads from 5 to 32 pitch, using either a single or multiple type cutter. Both cam feed and lead screw feed are available selectively. Length capacity is 9″ with a single cutter and 2″ with a multiple cutter. A controllable cross feed permits cutting partially or fully tapered threads. By proper set-up, this model can be made fully automatic.

For more detailed information and prices, please write . . .

HB

HILL-BARTELT MACHINE COMPANY
229 S. CHURCH ST. • ROCKFORD, ILLINOIS

"Take the contract and *Start Work Now* . . . we'll locate enough special-diameter drills to get you started tomorrow morning"

One of America's prominent Manufacturers recently was able to start work immediately on a heavy Emergency Contract because he had a Mill Supply Distributor who specialized in helping customers to break down emergencies.

Specifications called for holes of "out" diameter and only special drills could produce them—drills that no manufacturer could deliver within weeks.

Working with the Purchasing Department, the Distributor finally reported: "take the contract and line up production as fast as you can. I know where these millimeter drills can be had—*plenty of them* to keep you going until the factory itself can fill your order."

The contractor filled the War job on schedule—thanks to the Distributor who knew his way around and had made *his* organization a helpful, friendly part of the *Manufacturer's*.

Think of *your* Distributor today as a trustworthy purchasing and expediting assistant, trained in emergency to contact many sources of supply and to locate *somewhere* the items you need, if they can be had at all.

Supply Houses of the highest type have served for years as Distributors of Cle-Forge High Speed Drills and Peerless High-Speed Reamers. Please accept our own confidence in them as ample reason for our commending them to you—for they are located all over America and have been our Representatives for many years.

This incident is typical of the unusual services that many Mill Supply Distributors are rendering their customers during the Emergency.

ARMY NAVY

Awarded May 22, 1942
Superseded July 13, 1942

The CLEVELAND TWIST DRILL COMPANY
1242 EAST 49TH STREET
CLEVELAND

TRADE MARK REG. U. S. PAT. OFF. AND FOREIGN COUNTRIES

30 BEADE ST. NEW YORK · 9 NORTH JEFFERSON ST. CHICAGO · 650 HOWARD ST. SAN FRANCISCO
6515 SECOND BLVD. DETROIT · LONDON - E. P. BARRUS, LTD. - 35-36-37 UPPER THAMES ST., E.C.4

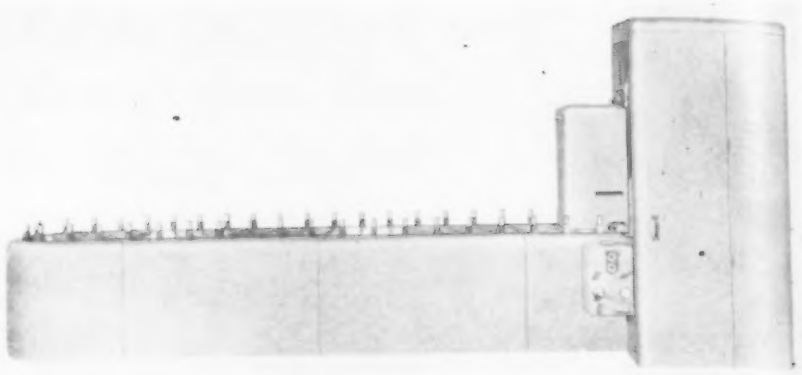
ARMY E NAVY

Awarded August 8, 1942
★

"CLEVELAND" DISTRIBUTORS EVERYWHERE ARE READY TO SERVE YOU

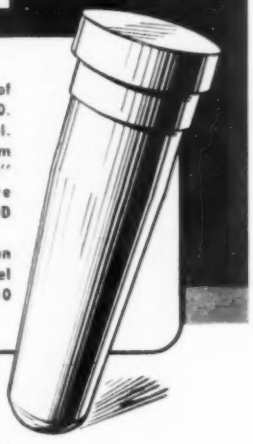
out. Spraying stations are located at one or both ends of the conveyor, depending upon the specific production rate. On one type three stationary automatic spray guns are actuated only when each shell moves within spraying range.

Another hook-up is for shells which have an inside adapter. This has a spray gun with a hook-type extension which, with another moving extension gun, coats all interior surfaces while a third moving gun coats the outside. The conveyor length is determined by the drying and handling requirements of each job. Either dry or water wash exhaust may be furnished.



New Shell Coating Equipment
Each made to do a specific job.

OUTPUT per punch UP 250%



CASE J143

Expanding punches of Ampco Metal Grade 20. Previously used steel. Nickel molybdenum rings 2.62" OD x 1.355" ID x 36" long were expanded to 2.95" OD x 1.91" ID

Result: maximum run of 3000 rings using steel increased to 10,500 using Ampco Metal

AMPCO Expanding Punches Have Longer Life

Again "Ampco" bronze proves its worth — this time in expanding punches. Here centrifugally cast Ampco Metal Grade 20 was used to expand nickel molybdenum rings, increasing OD .35" and the ID .553". Service life of Ampco punches was 3½ times that of hardened steel.

Ampco Metal Grade 20 has the necessary hardness — 212-248 Brinell for this application. Its strength and resistance to high compressive loads are other necessary factors in successful service. As many engineers know, it is the only copper base bearing alloy with these requirements. By using Ampco, you avoid metal weakness, failure and frequent replacement.

Ask for Data Sheet 100, describing the use of Ampco Metal in expanding punches.

AMPCO METAL, INC.

DEPARTMENT TE-1 MILWAUKEE, WISCONSIN

AMPCO METAL

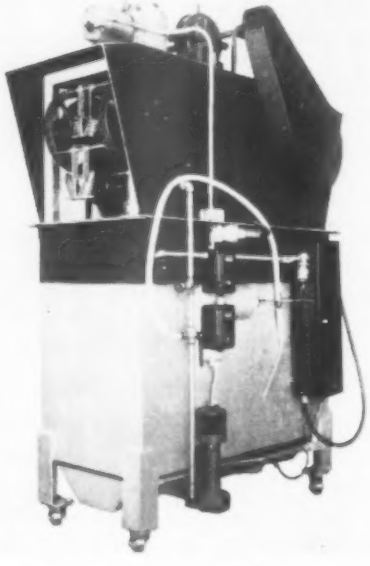
THE METAL WITHOUT AN EQUAL

INFORMATION FREE

For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 163.

AUTOMATIC SHELL DEGREASER (J60)

Using a conveyor belt equipped with swiveled carrier basket-pockets to automatically and continuously place the shells in position for cleaning, this shell degreaser, manufactured by the Phillips Manufacturing Company, 3475 West Touhy Avenue, Chicago, is said to efficiently degrease both the exterior and interior of shell casings.



New Automatic Shell Degreaser
Handles 20 to 75 mm. shells.

With the solvent injection of Phillsolv at an angle that is said to avoid the form-

(Continued on page 170)

FIGHTING TOOLS NOT FIGHTING TALK!

Ship worn-out High Speed Tools back to the steel mills – this high grade steel can do another war job.

If you want high production and accuracy from machine operators, give them high-grade cutting tools. Fighting tools – not fighting talk – produce results!

MORSE THERE IS A DIFFERENCE TWIST DRILL AND MACHINE COMPANY
NEW BEDFORD, MASS., U. S. A.

NEW YORK STORE: 130 LAFAYETTE ST. - - - - CHICAGO STORE: 570 WEST RANDOLPH ST.

ing of air pockets and insure thorough flushing, these degreasers handle 20 to 75 mm. shells. They are portable and do not require steam, water, or gas connections. They are self-contained and the heating of the solvent and the temperature control is handled by electricity.

The illustration shows a unit that handles 37 mm. pieces and is said to degrease them at a rate of 1,500 per hour.

The degreasing operation is as follows: The shell case is carried downward through the degreasing vapor and when it reaches a position above the nozzle, the solvent is injected under pressure to flush the interior. Then the shell rises on the conveyor and passes through a hot vapor zone and from there to the loading and reloading station near the top of the unit, which it reaches dry and clean.

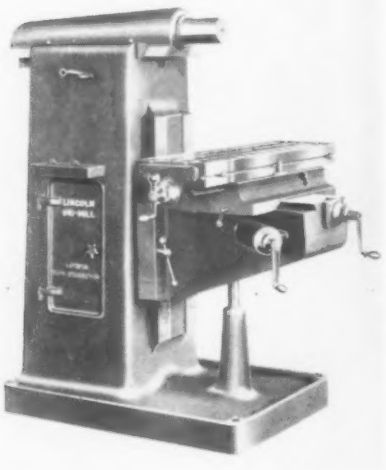
Easy access to the interior of the degreaser is claimed, because the conveyor and its driving motor form a removable section in the upper section of the housing. Solvent pump is designed for continuous operation.

INFORMATION FREE

For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 163.

NEW HEAVY DUTY MILLING MACHINE (J61)

This new machine is said to have been designed to handle heavy duty, high precision jobs and release power driven milling equipment for other essential work. It is manufactured by the Lincoln Machine Specialties Company, 549 West Washington Street, Chicago.



New Heavy Duty Milling Machine
Takes up to a 30 inch cut.

Called the "Uni-Mill," this machine is said to take up to a 30-inch cut. The table measures 10 inches by 42 inches and ample stability for heavy work is claimed because of its 2300 pound weight.

Designed to accommodate any make of high speed milling head, the machine is supplied either with or without detachable head.

UNIVERSAL MILLING ATTACHMENT (J62)

This new milling attachment, manufactured by Ajax Engineering & Manufacturing Company, 14230 Birwood Avenue, Detroit, is claimed to be designed for high speed milling, drilling, boring, and counter boring on any angle.

Construction features include a sturdy, hardened spindle, ground to precision limits with No. 7 Brown and Sharpe or No. 3 Morse taper for all

(Continued on page 172)

CIRCLE "R" METAL CUTTING SAWS

NO WONDER THEY'RE GOOD

This company has been making circular metal cutting saws since 1923, when it was founded, and all its officers and employees were experienced saw makers for a long time before that. Almost all of our factory space, 20,000 square feet, is devoted to this one product.

So it is a fair assumption that we "know" circular saws. In fact we *have* to, because our reputation depends chiefly on this one product. No wonder circle "R" saws are good!

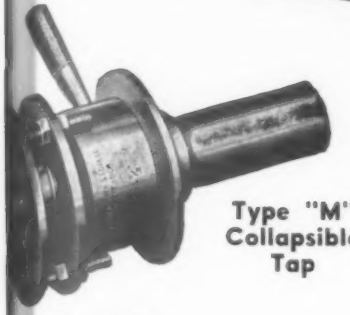
Have you tried them? If not, send for our Catalog K.

PRECISION CONTROL

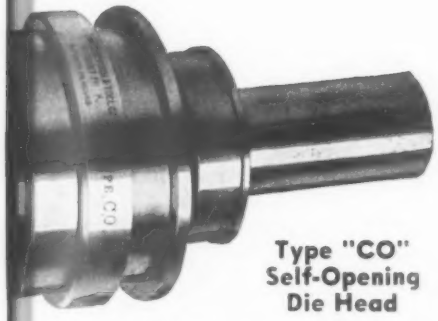
of manufacturing is another reason why Circle "R" saws are good. Our modern heat treating ovens have potentiometric control, the most accurate method for the purpose.

CIRCULAR TOOL CO., INC.
PERFECTIONISTS IN TOOL MANUFACTURING
PROVIDENCE, RHODE ISLAND
CHICAGO • PHILADELPHIA • NEW YORK • DAYTON • CLEVELAND
SYRACUSE • INDIANAPOLIS • DETROIT • ST. LOUIS

There's A Murchey for MOST Threading Jobs!



Type "M" Collapsible Tap



Type "CO" Self-Opening Die Head

WHETHER it's a question of size, tolerance or production, Murchey threading equipment covers a wide range in cutting external or internal threads.

The new No. 42 Murchey Thread Milling Machine extends the range into the zone of larger diameter threads from 4" to 12", external or internal, right or left hand, where extra accuracy is needed.

The use of full-length annular milling cutters, and accurate control of pitch and depth produces precision-cut threads at a production rate which will interest you.

Murchey also manufactures all types of Collapsible Taps, Self-Opening Die Heads and Shell Tapping Machines

MURCHEY MACHINE & TOOL COMPANY

DETROIT, MICHIGAN

standard mills, capacity 1/16 inch to ½ inch diameter. It is equipped with a draw bar for Weldon type holder or collets.

This head has three radial thrust SKF precision flush ground bearings or Timken tapered bearings mounted in a heavy cast iron housing. Said to be easily mounted on a machine by one man, the attachment weighs 90 pounds and has a 4 inch vertical travel.

The machine clamps on the overarm of any horizontal milling machine and swings into the desired position. The heavy overarm clamp is graduated 360 degrees. Among the other features of the machine is found a ¾ inch feed screw with 10 pitch Acme threads, fitted with heavy bronze nut for accuracy. A ball thrust end bearing and adjusting screw are said to take up the back lash.

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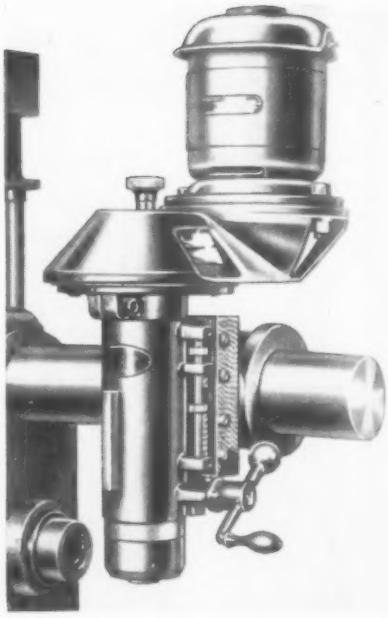
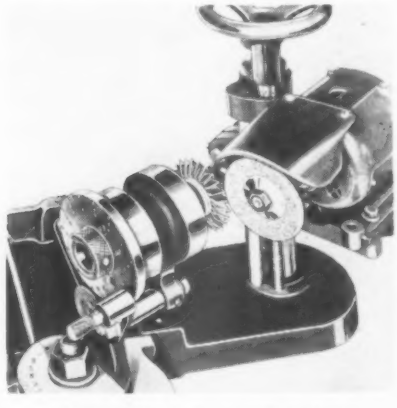


New Universal Milling Attachment
Designed for work at any angle.

UNIVERSAL CUTTER-GRINDER (J63)

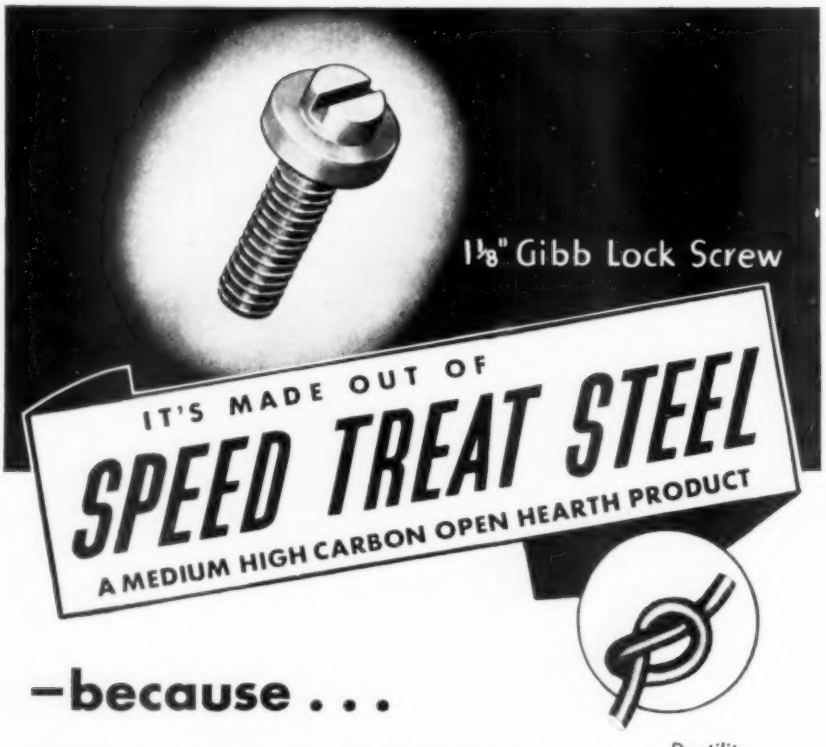
A new Hilco Universal Cutter-Grinder with a special index dividing head has recently been announced by the Berco Manufacturing Company, 429 West Superior Street, Chicago. It is claimed that it will grind to perfect sharpness any concave, convex, helical, straight, tapered angle or special cutter up to 6 inches in diameter and any saw up to 18 inches in diameter — regardless of cutting angle required.



New Hilco Cutter-Grinder
Has index dividing head.

Furnished with an interchangeable table or flat bed attachment, this machine features a dividing head which has 7 index circles consisting of micrometer placed holes or stops which are

(Continued on page 174)



—because . . .

Speed Treat's natural strength eliminated breakage

Speed Treat's machinability gave perfect threads

Speed Treat's "clean" cutting reduced scrap 40%

Speed Treat saved $21.00 per ton in costs

Ductility Plus Machinability (170 SFPM)

In this "all-out" war effort Monarch Steel is co-operating 100%. We're helping to "keep 'em rolling" with Speed Treat Steel.

Licensor
MONARCH STEEL COMPANY
HAMMOND • INDIANAPOLIS • CHICAGO
PECKOVER'S LTD., Toronto, Canadian Distributer

Licensee for Eastern States
THE FITZSIMONS COMPANY
YOUNGSTOWN, OHIO

MANUFACTURERS OF COLD FINISHED CARBON AND ALLOY STEEL BARS

IN '43 *and in the Future...*

SPEED *YOUR* PRODUCTION with SIMPLEX MACHINE

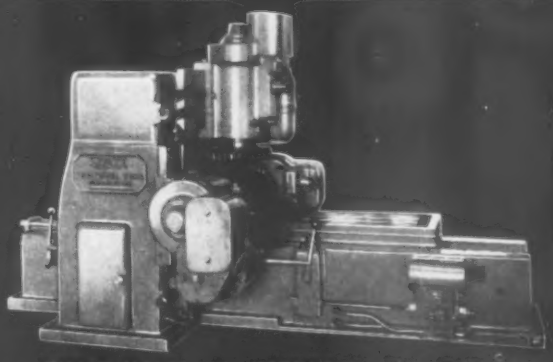
Right now your production must reach new peaks. Victory depends on it! . . . In the peace to follow, *competition* will demand in your shop a continuation of this same efficient production.

Simplex Machine Tools are Precision Built for Precision Production

Profit with Simplex's high production, low cost, *accurate* boring and milling. Simplex Boring Machines are available in 25 types and sizes, in both mechanical and hydraulic feeds. Simplex Unit-Type Boring Machines may be had in single and double end, three or four way; also in knee and angular types. In addition, a wide range of models is offered in Simplex Planer-Type Production Milling Machines. Special production machine tools built to meet your individual requirements.

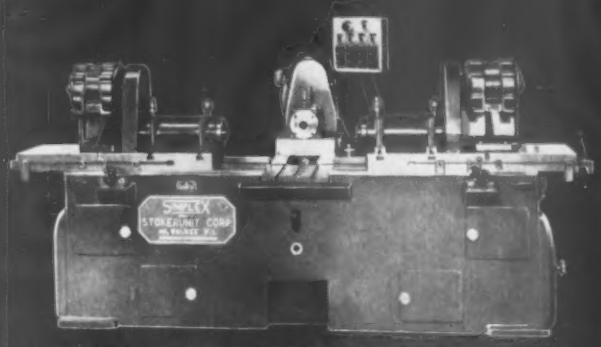
Get FREE Catalogs and Estimates *Today*

Send coupon now for FREE catalogs describing the many advantages of Simplex Boring and Milling Machines. Include blueprints of parts for FREE estimates and specific machine recommendations. There is no obligation.

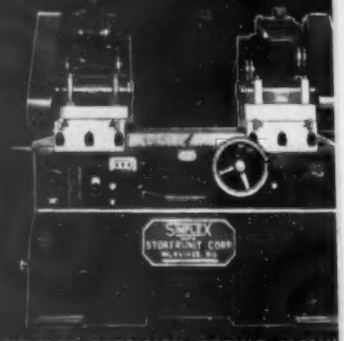


SIMPLEX PLANER-TYPE PRECISION MILLING MACHINES. For high production milling of duplicate parts, or for general-purpose face milling of similar parts. Available with 1, 2, 3 or 4 heads for simultaneous milling of several surfaces. (3-head machine shown.)

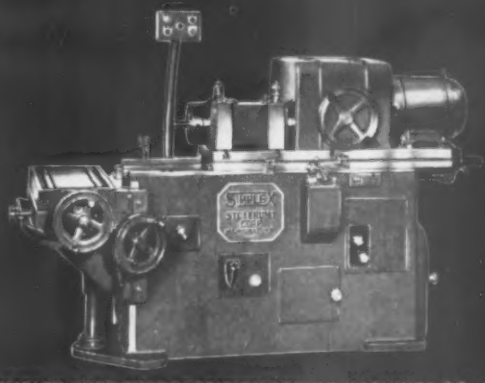
SIMPLEX PRECISION BORING MACH No. 1. Provides maximum econo and accuracy in boring small pa such as precision bearings, actuat cylinders, etc. With 1 or 2 spind (2-spindle machine shown.)



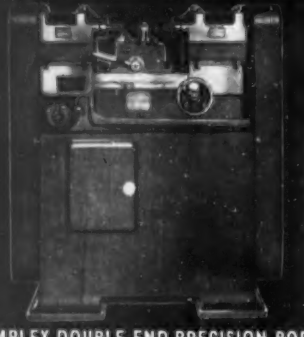
SIMPLEX UNIT-TYPE PRECISION BORING MACHINES. New flexibility provides wider application than conventional machines. Shown is No. 2U 3-Way Machine with 3 No. 3 spindles, arranged for boring differential housings, air and electric tool parts, governor housings, etc.



SIMPLEX PRECISION BORING MACHI SERIES 200, 4 spindles. Especially signed for shops where a large num of production jobs of varying ty must be handled by one machi



SIMPLEX KNEE-TYPE PRECISION BORING MACHINES. Model No. 3U, illustrated above, is equipped with No. 3 spindle, variable speed spindle drive, turret stop for table. Designed for accurate, precision boring, particularly where one machine must be used for a variety of jobs.



SIMPLEX DOUBLE-END PRECISION BOR ING MACHINE No. 1. Arranged for double-end operation in boring automobile steering spindles, etc. Work fixtures are mounted in the middle.

FREE Catalogs, Estimate and Recommendat

STOKERUNIT CORPORATION 98 W. Mitchell St., Milwaukee, Wis. d me catalogs and complete data without obligation. Boring Machines ☐ Milling Machines ☐ I encl sprints of parts for estimates and machine recommendatio

TITLE

STOKERUNIT CORPORATION

MILWAUKEE, WISCONSIN

said to insure perfect uniformity of cutting edges in the finished cutter. It is claimed by the manufacturer that any conceivable simple or compound angle, horizontal, diagonal, or vertical, direct or reverse position, may be quickly set up to accommodate any type cutter.

This is a bench type machine and is 21 inches long, 17 inches deep, and 17 inches high and weighs approximately 135 pounds. The accompanying illustration shows the cutter-grinder with the special index dividing head set up to sharpen double angular cutter.

MILLING MACHINE (J64)

A new milling machine of smaller size and available in both tool room and production models is now being offered by the Diamond Tool Company, 3429 East Olympic Blvd., Dept. TE, Los Angeles. Although they are considerably smaller in size than other makes, it is claimed by this concern that these machines provide the rigidity, precision accuracy, and capacity of larger machines.

Included in the construction of this milling machine are such features as: precision high speed needle overarm arbor-support bearing; vertical collapsible pulley arrangement, with safety device and motor lock for speed changes; maximum anti-friction bearings

New Small Size Milling Machine
Tool room and production models.

with the minimum number of manual lubrication fittings; and a one-shot, spider-web lubricating arrangement for the table, saddle, and knee.

To speed up output, the production model is equipped with rack and pinion. This type of machine, Model 20, has interchangeable accessories.

● How come? Well, I'll tell ya—The Welding Boys down at Skunk Creek and the Die Fellers at Coon "Holler" got tired of beating each other's pants off, so in order to compromise, they decided to join hands and wallop the Axis instead. In other words, the tool and die game has nobly conceded the importance of welding within its ranks. This detracts not a particle from the prominence of the tool and die industry. By welding we mean the use of Eureka Tool Steel and Alloy electrodes on oil, air and water hardening dies and the now famous "Suttonizing" welding process that thoroughly reclaims high speed steel tools of most every sort.

Phone Fitzroy 3715 or write direct to

Welding Equipment & Supply Company

222 Leib Street, Detroit, Michigan

INFORMATION FREE

For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 163.

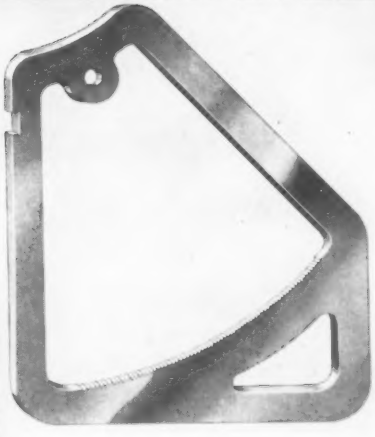
ROCKER ARM RESISTANCE WELDER (J65)

A new rocker arm resistance welder for the spotwelding of aluminum and its alloys which offers several unique advantages has recently been announced by Sciaky Bros., 4915 West 67th Street, Chicago. One advantage is the adjustable electrode tips which may be set at any angle without impairing their proper welding position, it is claimed. Such settings are said to make possible the welding of unusual shapes and

(Continued on page 176)

LINES BEHIND THE LINES

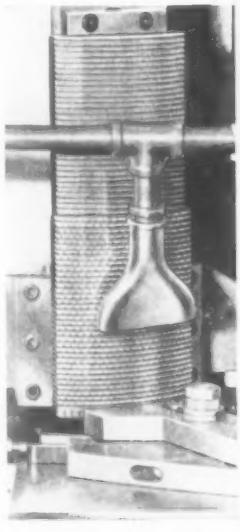
"ALL THIS AND TIRES TOO!" SAYS THE 100% CONVERTED RUBBER INDUSTRY, NOW MANUFACTURING IMPLEMENTS OF MECHANIZED WAR



BY SPEEDILY CONVERTING part of its plant to the manufacture of guns and other munitions, rubber eminently deserves credit as one of the production lines behind the firing lines. Noteworthy is the industry's recognition of broaching as a better way to do many metal-working jobs — the only *right* way to do some!

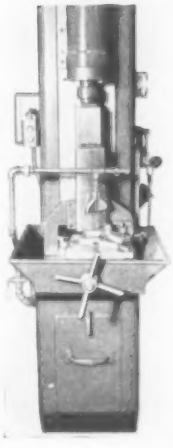
* * * *

TEETH IN GUNNER'S QUADRANT *(left)* are one of the forms which only broaching can do with the speed and precision required.



BROACH DESIGNED, with special engineered clamping and holding fixture, by *American* (left), finishes radius and cuts teeth with one pass of the tool.

BROACHING MACHINE (right), *American* made V-1½-4 ton, reduces set-up, loading, and operating time — does a precision job at a production rate!



BROACHING IS BETTER THE *American* WAY

American

BROACH AND MACHINE CO.

ANN ARBOR, MICHIGAN

•

BROACHING MACHINES
PRESSES
BROACHING TOOLS
SPECIAL MACHINERY

DIVISION OF SUNDSTRAND MACHINE TOOL CO. ROCKFORD, ILLINOIS

sizes of metals.

Another advantage pointed out by the manufacturer is that all gauges and dials are visible to the operator and are arranged on the frame of the machine. The welding process incorporated in this rocker arm welder is said to compensate for the natural expansion that takes place when the metal is in the molten state during the welding process. The process of resistance welding preheats the metal tending to overcome high thermo conductivity, thus slowing down the cooling process and providing a "forging" pressure which is said to preclude the possibility of shrinking the metal after the weld.

This machine supplies a total pressure of 3,000 pounds between the electrode tips, using a throat depth of 34 inches. The welding capacity is said to be .080 inch plus .080 inch, 24ST

INFORMATION FREE

For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 163.

New Rocker Arm Resistance Welder
Spotwelds Aluminum and its alloys.

Alclad. The welding stroke is ½ inch and the retraction stroke is 3½ inches. A special face plate at 45 degrees can be incorporated with the vertical face plate for special work.

STRADDLE-MILLING SPACER (J66)

Said to save hours of set-up time, a new straddle-milling spacer has been recently announced by the David J. Ross Company, 108 Ross Park, Benton Harbor,

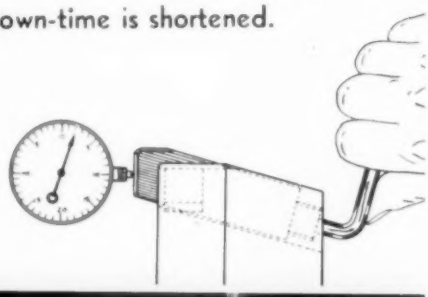
New Straddle-Milling spacer
Said to save set-up time.

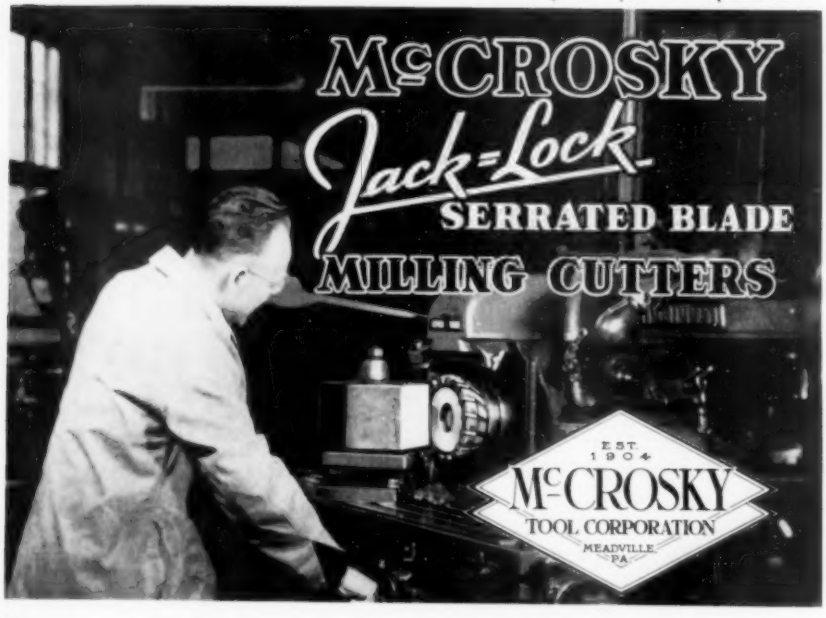
Michigan. The manufacturer claims that this new type of adjustable spacer is designed to save the time usually spent in grinding conventional spacers to accurate size for straddle-milling.

In operation, the spacer is slipped onto the arbor, together with conventional type spacers, and then is screwed to a setting said to be accurate to .001 inch.

(Continued on page 178)

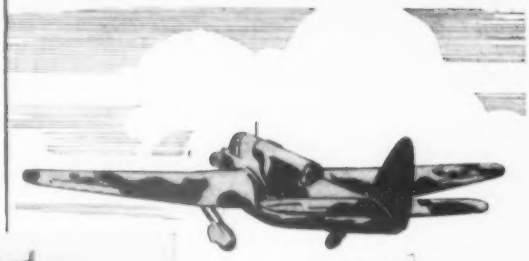
HERE'S a McCrosky Series "C" Face-Milling Cutter — expertly designed and ruggedly built for the high pressure of war-time production. Its JACK-LOCK wedges can be quickly locked and unlocked. And an individual adjusting screw behind each blade permits blades to be adjusted easily and ***UNIFORMLY*** (see line-drawing) so that a minimum of blade stock is sacrificed in resharpening. High-speed steel is conserved, and down-time is shortened. Cutter life can be renewed many times by inserting new blades in the original body. WRITE FOR BULLETIN 16-M.

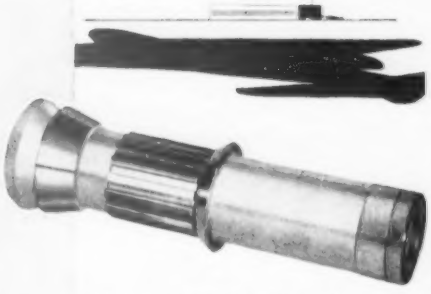




NO. 1 AIR BASE

For Tooling, Special Production and Standard Air Service Equipment



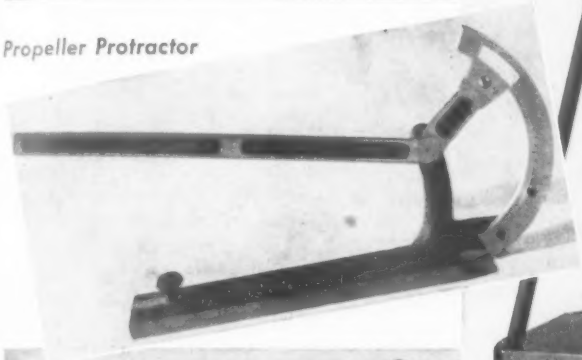


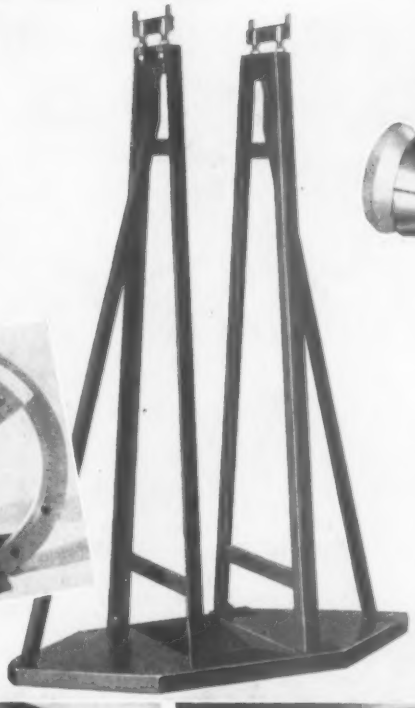
Above: Special Spline Gage for Propeller Shaft

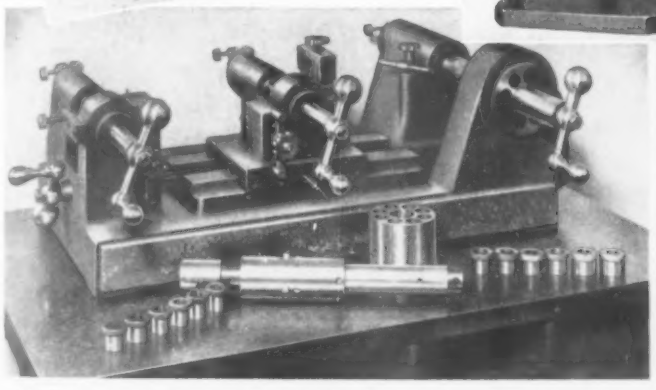
Left: Propeller Balancing Stand

Below: Taft-Peirce Back Spot Facing Machine

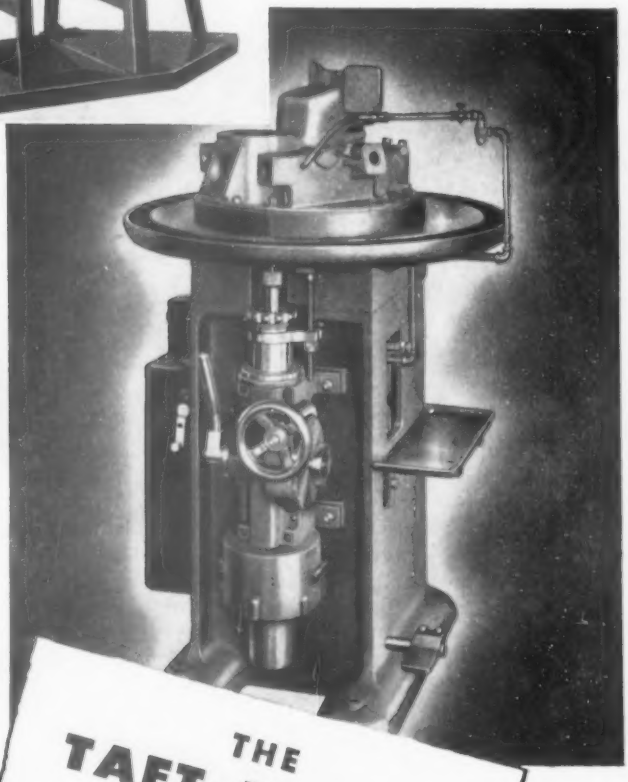
Propeller Protractor







Universal connecting rod boring fixture for aircraft motors



Propeller-checking Plate

THE TAFT-PEIRCE Manufacturing Co., Woonsocket, R. I.

and locked into position by the inner locking ring. Adjustment for length is said to be approximately ½ inch.

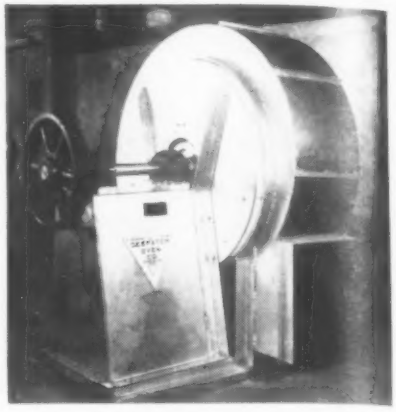
These spacers are made of alloy steel, hardened and ground, and accurately threaded and finished. They are said to be adaptable to all standard milling machines through a range of 5 arbor diameters (1, 1¼, 1½, 1¾, and 2 inches).

INFORMATION FREE

For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 163.

FANS FOR FURNACES AND OVENS (J67)

Said to be suited to virtually all heavy duty high-volume requirements involving temperatures to 1600 degrees F., high temperature acid-resistant fans of alloy steel are now being offered to the trade by Despatch Oven Company of Minneapolis. In the past, this type of fan has been used on Despatch industrial furnaces and ovens.



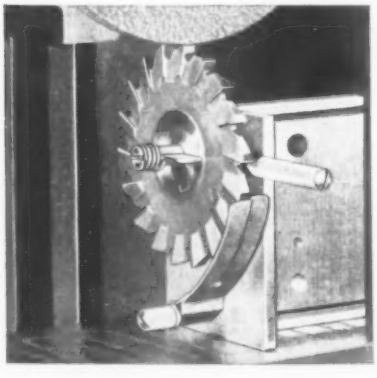
Fan for Furnaces and Ovens
Eleven sizes are available.

The chief feature of this fan in contrast to other fans is claimed to be engineered design and construction combined with precision balancing. They are all-welded and the pedestal, side, and scroll sheets are heavy-gauge with strong reinforced angles.

Eleven sizes are available, ranging from 12 inch diameter wheels up to 48 inch wheels, handling total pressures to 10 inch W. G. A belt drive is used on all models and wheel is overhung. The outlet can be arranged in 16 standard positions. Other features include a shaft which is supported on two large air-cooled bearings.

MILLING CUTTER GRINDING FIXTURE (J68)

A new milling cutter fixture, recently announced by Acro Tool & Die Works, 5324 N. Kedzie Avenue, Dept. EE, Chicago, is said to accurately position milling cutters, circular saws, gear cutters,

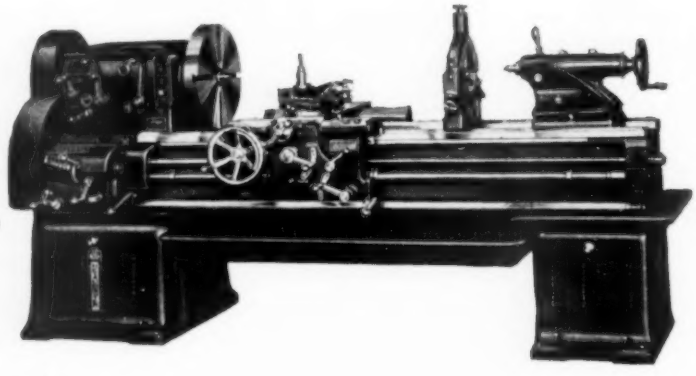


New Milling Cutter Fixture
Said to be "fool-proof."

and other cutters on the surface grinder and simplify high-skill grinding operations.

(Continued on page 180)

SUPER PRODUCTION LATHE



The Metalmaster

One of the outstanding features of this BRADFORD lathe is the spindle. It is manufactured from a high carbon molybdenum steel forging and bored from the solid stock straight through from end to end. It is ground true to a standard size after final finishing cuts are taken. Threads are then chased on the nose which is bored to receive a taper bush and center. The running balance is perfect and the thickness of the spindle uniform, insuring against springing and consequent chattering. The spindle extends through the head and thus allows for the use of draw bars and tubes for draw-in attachments.

ALSO MANUFACTURERS OF DRILLING AND TAPPING EQUIPMENT

THE BRADFORD MACHINE TOOL CO.
EVANS STREET SOUTH OF EIGHTH, CINCINNATI, OHIO
PRECISION TOOLS SINCE 1840

HOW "Detroit" STANDARDIZED SPECIAL TAPS for SHELL for FASTER DELIVERY

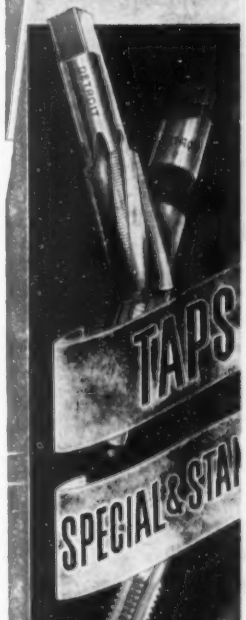
Above: A group of 40 mm. shell, with some of the standardized DETROIT taps and the DETROIT thread gage used for checking the threads.★

A year ago practically every manufacturer of 40 mm. shell had his own specifications for the special taps required for identical operations: threading the ends of the shell body. With a score of companies involved, Detroit Tap engineers saw that if an agreement could be reached on the design of tap for these identical operations by different manufacturers that deliveries of taps could be speeded.

After thoroughly investigating the field requirements, Detroit Tap engineers recommended two standardized designs, one for each end. ★Today already well over half of these 40 mm. shell producers are using standardized special "DETROIT" taps—now turned out by "DETROIT" on a PRODUCTION basis with greatly expedited deliveries.

★Similar Standardized Taps for 20 mm. Shell also available

A new Detroit Tap Catalog will be off the press shortly. Shall we reserve a copy for you? Ask for Catalog 22TE on your company letterhead.



DETROIT TAP & TOOL Company 8432 R

Trade-named "Kutrite," the manufacturer claims that, with this new fixture, a shopman can quickly and accurately grind both the ends and sides of cutting edges. Uniformity of product is claimed because each grind is an exact duplicate of the others. It is said to be "fool-proof" and has adjusting rods to permit the quick setting of proper angles. This fixture is made of hardened and ground steel.

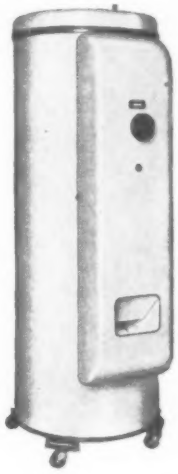
INFORMATION FREE

For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 163.

RIVET DISPENSER (J69)

A new selective automatic rivet dispenser, said to overcome disadvantages in handling bulk iced rivets in aircraft plants, has recently been announced by Revco, Inc., Adrian, Michigan.

A specially developed rivet container with reinforced metal top and bottom and waxed surface is said to make it possible to process the rivets from quench through storage to the final assembly line with the rivets sealed in the protective container. The usual freezing of rivets due to condensation is thereby eliminated.



New Revco Rivet Dispenser
Features special rivet Containers.

In dispensing the rivet container, the operator dials for the size desired, presses a button, and receives a container of the rivets cooled to -30 degrees F.

The dispenser is 63 inches high, 22½ inches wide, and 26½ inches deep. It has a capacity of 120 containers, each holding ¼ pound of rivets, and can dispense the containers at a rate of 15 per minute.

LATHE CENTER LUBRICANT (J70)

Said to be a combination of pure flake lubricating graphite and other specially formulated ingredients, a new lubricant for the dead centers of lathes has been developed by Joseph Dixon Crucible Company of Jersey City, N. J. Said to withstand the high pressures and temperatures developed at dead center in lathe work, this lubricant controls overheating and protects the dead centers against scoring and softening.

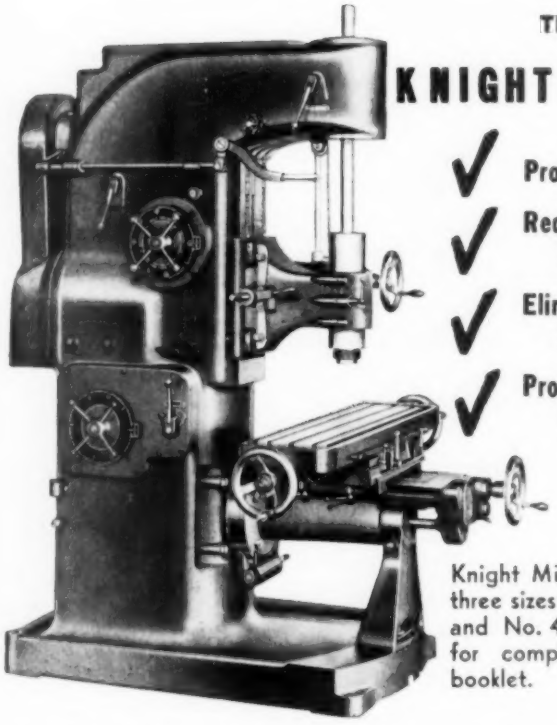
The manufacturer claims that this new product also has many uses as an anti-seize compound where a lubricant of extreme film strength is required. It is marketed in 1, 4 and 8 ounce tubes.

SELF-ADJUSTING JIG CLAMPS (J71)

Products Engineering Corporation, 700 East Florence Avenue, Los Angeles, California, has recently announced a

(Continued on page 182)

GREATER RETURN PER $$ INVESTED



THE
KNIGHT MILLER

- ✓ ProducesMoreWork
- ✓ Requires Less Equipment
- ✓ Eliminates Hours of Layout
- ✓ Produces Quality Results

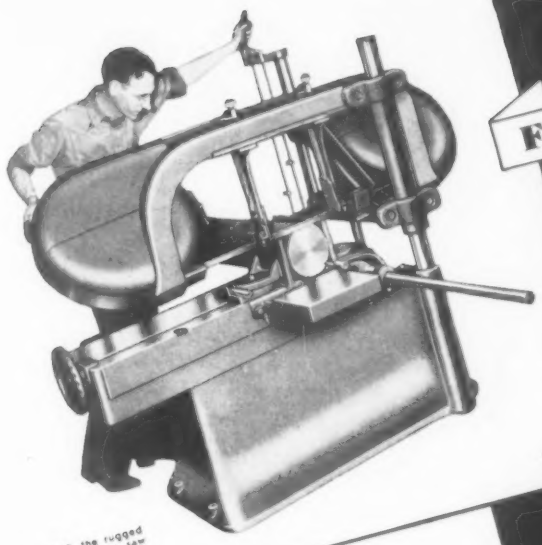
Knight Millers are made in three sizes: No. 20, No. 30, and No. 40. Write today for completely illustrated booklet.

• Knight Millers give a maximum of versatility, rigidity, accuracy, speed, and power without sacrificing one quality for another. They feature balanced design for the production shop.

The operator's production time is cut through easy reading dials and a readily accessible shift lever. Truly an investment that pays in greater production!

W. B. KNIGHT MACHINERY CO.
3920 WEST PINE
SAINT LOUIS, MO.

36 Years A Builder of Quality Milling Machines



Wells V-12, the rugged new heavy duty saw which features hydraulically controlled feed and lift

V-12

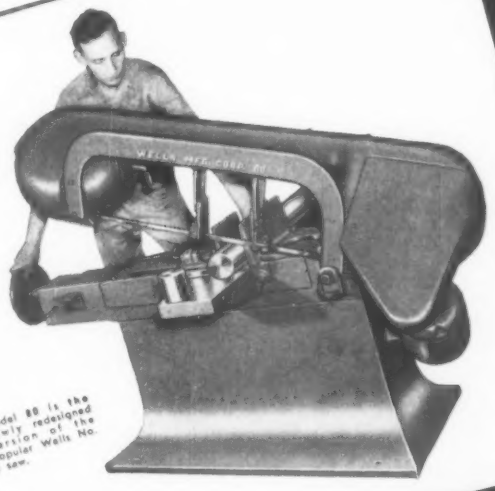
FAST-ACCURATE
VERSATILE

WELLS

Continuous Metal Cutting BAND SAWS

for

PRODUCTION • TOOL ROOM
MAINTENANCE • GENERAL UTILITY



Model 80 is the newly redesigned version of the popular Wells No. 8 saw.

SERIES 80

WITH Wells Metal Cutting Band Saws you can apply the advantages of continuous cutting action to virtually all kinds of metal cutting jobs. Almost all metals in all shapes are cut quickly and accurately at minimum expense. Designed to provide maximum efficiency for saws of this type, Wells Metal Cutting Band Saws offer you these advantages:

Capacity is the greatest of any saw for the money.

Simplicity is engineered into the machine to give a lifetime of service.

Three speeds of the CORRECT amount of feet per minute assure most efficient cutting and long blade life.

Controlled feed is positive and accurate.

Heavy I beam holds and brings fully adjustable guides close up to the work for accurate cutting.

No coolant required even when cutting tool steels.

Heavy sturdy construction—no vibration.

And a host of other details that mean better metal cutting at lower cost.

Wells Has Established Leadership

WELLS MANUFACTURING
CORP., THREE RIVERS, MICH.

Write for complete details

SPECIFICATIONS

SPECIFICATIONS	V-12	No. 80
Capacity: Rectangular	13"x16"	8"x16"
(Special bowed guides)		5"x24"
Rounds	13" dia.	8" dia.
Speeds: Feet per minute	33, 94, 148	60, 90, 130
Motor Size	¾ H.P.	½ H.P.
Swivel Vise	to 45°	to 45°
Blade Size	13' 7¾"x.032"	11' 6"x.031"
Height to top of table	24"	25½"
Width of Bed	12"	10¾"
Drive	"V" Belt	"V" Belt
Floor Space	73"x30"	2'x6'

WELLS MANUFACTURING CORPORATION
Wells METAL CUTTING BAND SAWS
1212 MONROE ST. • THREE RIVERS, MICHIGAN

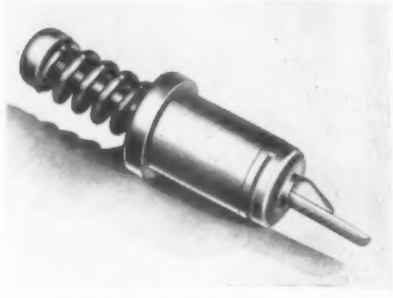
new line of self-adjusting jig clamps that can be locked in infinite positions up to 15 degrees above or below horizontal it is claimed. Marketed under the trade name of "Pec", these clamps are said to make it possible to carry a smaller stock of jig clamps because this clamp has a wider range than the non-adjustable ones.

The infinite adjustments are made possible through the use of a slotted aperture that functions much like that found on a pair of pliers. Besides this self-adjusting feature, these clamps are said to have positive lock, are quick-acting, and are of drop-forged construction. This new feature is available in many different types of clamps.

New Self-Adjusting Jig Clamp
Infinite adjustments possible.

NUT PLATE FASTENERS (J72)

Included among the new developments for aircraft skin assembly recently introduced by Prestole Division, Detroit Harvester Company, Toledo, Ohio, is the "Prestite" nut plate fastener. These nut plate fasteners are used for holding nut plates temporarily while they are being riveted to aircraft sheets.



"Prestite" Nut Plate Fastener
Helps in aircraft skin assembly.

Said to save valuable time, these fasteners eliminate the need of using screws as a holding means. A shoulder in the fastener automatically locates the nut concentric with the clearance hole in the sheet. This feature is said to permit the holes in the base of the nut plate to be used as a template for drilling the rivet holes in the sheet if desired.

Another development announced by this concern is a Prestite "Safety Champ" Gun. This gun is used for assembling Prestite or other skin holders to aircraft sheets. One unique feature is said to be the use of hardened steel clips in the muzzle which is claimed to increase the life of the gun and provide greater safety because the clips grip the fastener around more than half its diameter instead of depending on point contact.

INFORMATION FREE

For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 163.

LEVELING JACKS (J73)

A new, improved leveling jack for machine tools, special machinery, industrial furnaces, large surface plates, and other tool room and production

(Continued on page 184)

"YOUR HIGH SPEED TOOL STEEL SCRAP IS BADLY NEEDED---MAKE THIS YOUR CONSERVATION PROGRAM...."

1. DO NOT THROW AWAY ANY SCRAP.
2. SEGREGATE HIGH SPEED TOOL STEEL SCRAP FROM REGULAR SCRAP METAL.
3. WHEN A REASONABLE AMOUNT HAS BEEN SAVED, SEE THAT IT GETS BACK TO THE STEEL MILLS THROUGH THE PROPER CHANNELS.

Do not return to Wood & Spencer.
You can cut down waste on taps by carefully selecting the right tap for every job. We'll be glad to help you . . . write on your company letterhead for our latest catalog.

"THE RIGHT TAP AT THE RIGHT TIME"

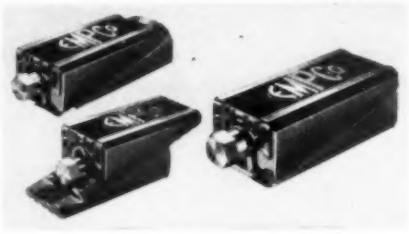
The Wood & Spencer Company
Cleveland, Ohio

WHEN YOU CAN'T GET SPECIAL TOOLS
Super STANDARD TOOLS ARE EASILY ALTERED TO SUIT YOUR NEEDS
Ask for Circular No. 40
SUPER TOOL CO.
21650 Hoover Road
Detroit, Michigan
Carbide Tipped Tools
FOR TURNING • FACING • REAMING • SPOTFACING • BROACHING
FORMING • GRINDER RESTS • WEAR PARTS • BORING • MILLING • DRILLING
GROOVING • COUNTERBORING • SHAVING • CENTERS • SPECIAL PURPOSES

equipment has recently been announced by Enterprise Machine parts corporation, 2731 Jerome Avenue, Detroit.

The improvement on these jacks is said to be that they are so designed as to align themselves to the most uneven floor. The upper casting has ground slipways to minimize the friction at point of contact with machine base. Another feature claimed by the manufacturer is the increased limits of adjustments, either up or down.

The jack assembly is composed of three parts. They are supplied in small, medium, and large sizes. The small size has an adjustment of ½ inch, the medium ⅞ inch, and the large 1¼ inch.

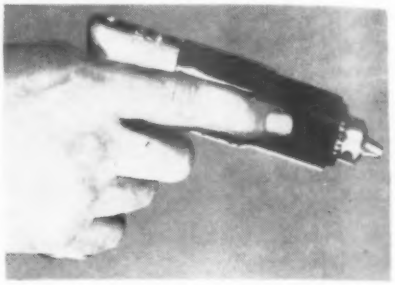


New Type of Empco Leveling Jacks
Align themselves to uneven floors.

LIGHTWEIGHT PNEUMATIC DRILL (J74)

Weighing less than 2 pounds, a new pneumatic drill, manufactured by Ingersoll-Rand Company, 11 Broadway, New York, is said to be finding wide application, especially in aircraft production. It is powered by a "Multi-Vane" air motor and is identified as the size OOA drill.

Lubrication is provided by a built-in automatic oiler, speed is controlled by a built-in speed regulator, and accurate hole-starting is said to be possible through split-second throttle action. Fatigue is said to be reduced because of the light weight of the drill and pistol grip. The chuck shield not only offers protection, but also enables the operator to guide the drill more effectively by grasping the shield with the fingers of his free hand.



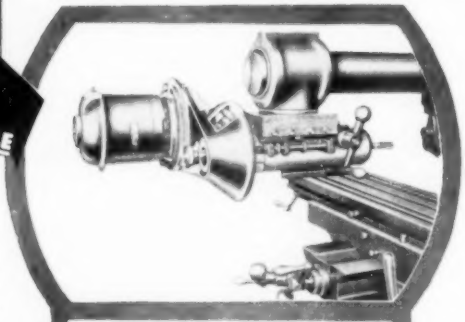
New, Lightweight Pneumatic Drill
Said to weigh less than 2 pounds.

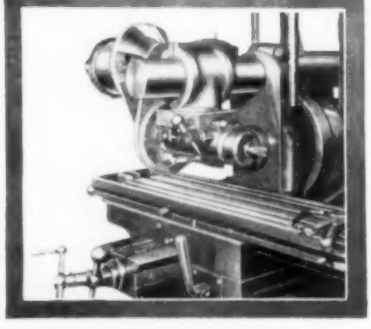
New HALCO UNIVERSAL HEAD

for High Speed MILLING, DRILLING, BORING and COUNTER BORING

Five Speeds 350 to 2900 R.P.M. Also 10 speeds 125 to 2900 R.P.M. available at extra cost.

FOR HIGH SPEED MILLING, DRILLING, BORING AND COUNTER BORING UP TO ANY ANGLE





THE Halco Hi-Speed Universal Milling Attachment has proven its importance in building tools, dies, jigs, fixtures, wood and metal patterns and other machine products. Its 4-inch vertical travel permits many milling, boring and facing operations in one setup, a factor of convenience to which is added the advantage that the unit can be easily mounted by one man, it weighing only 90 pounds. Each head is unconditionally guaranteed for six months.

IMMEDIATE DELIVERY

(Designers and Builders of Fine Machine Tools)

SEND TODAY FOR FOLDER

AJAX ENGINEERING & MFG. CO.

MANUFACTURERS OF HALCO PRODUCTS

14230 BIRWOOD AVE., DETROIT, MICH.

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MOTORIZED LIFT TRUCK (J75)

The HydroLectric motorized hand lift truck, manufactured by Lift Trucks, Inc., Cincinnati, Ohio, has such features as rear wheel drive, automotive gear transmission, and excess motor and battery power. In a 14 day test at a large machine tool plant, this lift truck handled average loads of 5000 pounds continuously from 20 to 24 hours, it is claimed by the manufacturer.

It is said that inexperienced men can operate the HydroLectric because maximum loads are easily lifted through a powerful hydraulic ram. A patented finger control, when pressed, moves heavy loads forward or backward with-

(Continued on page 186)

Use Standard Jig and Fixture Parts

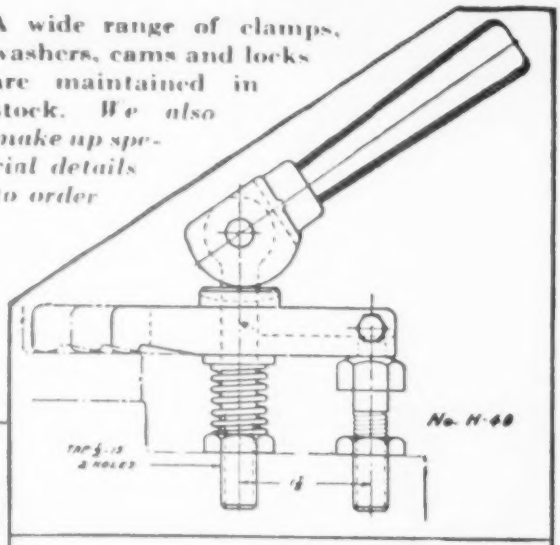
Save 50% Designing Time and Many Man-Hours in Construction

HOW TIME IS SAVED:

(1) Check your assembly drawings, note details
(2) Select details from Siewek Catalog (loose-leaf binder with working drawings on each page)
(3) Remove sheets with details selected, insert under layout and trace, show location and size of necessary holes
(4) Mark detail with Siewek Catalog number

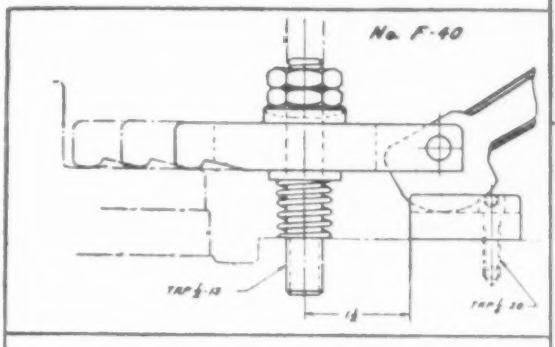
Clamps, Cams, Washers, Nuts, Clamp Rests and Hinge Pins are hardened. Studs are alloy steel heat treated.

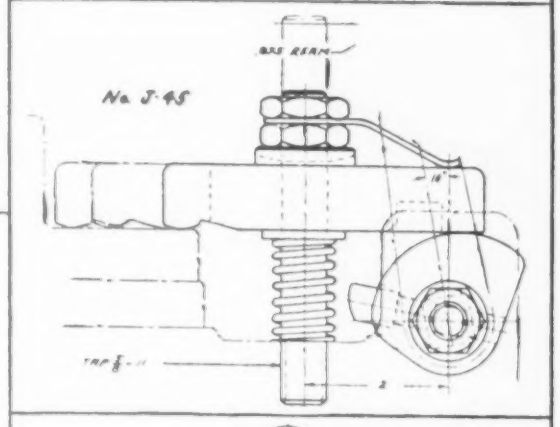
A wide range of clamps, washers, cams and locks are maintained in stock. *We also make up special details to order*



Clamp Assemblies

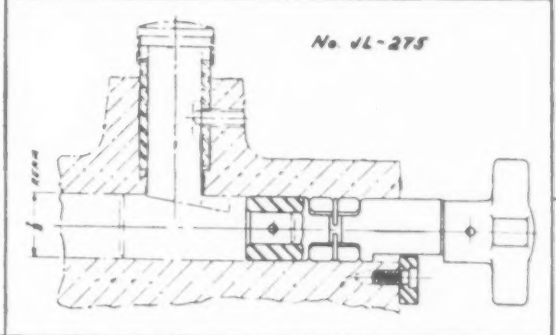
H-40
J-45
L-60
C-40
F-40
M-15





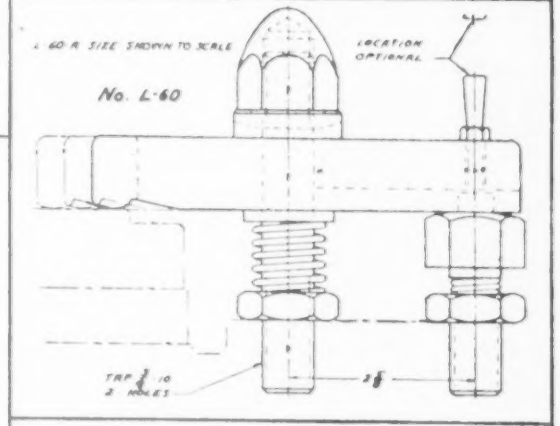
Jack Lock

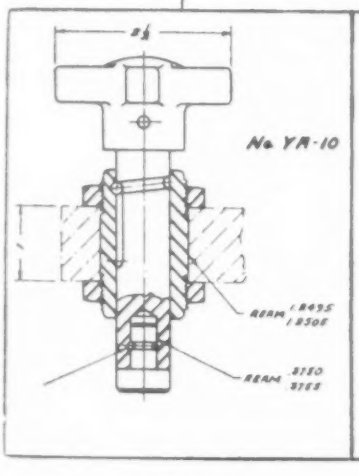
JL-275

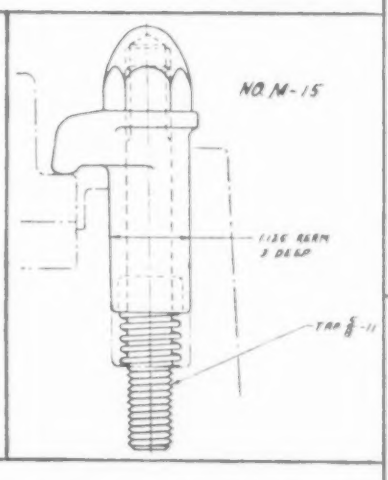


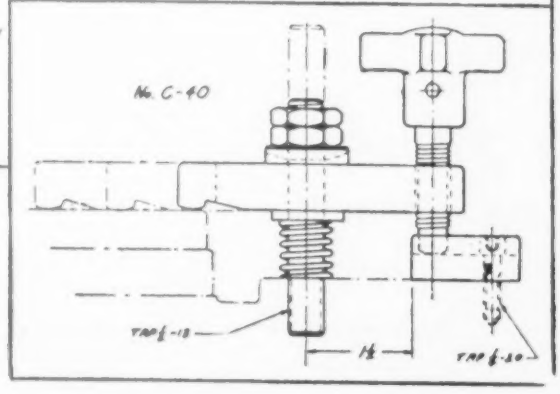
Cam Long Lock Travel Clamp

YA-10









Send TODAY for your copy of Siewek loose-leaf, template tracing catalog.

SIEWEK TOOL COMPANY

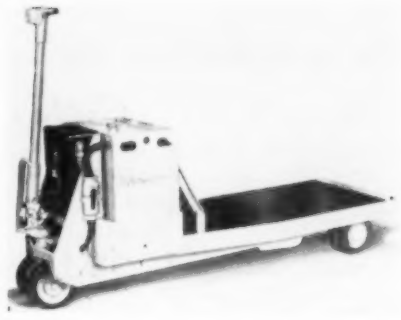
2348 Wolcott St. Ferndale, Mich.

out effort.

Advantages of this motor lift claimed by the manufacturer include a powerful motor, a large battery, a rear load wheel drive to insure positive traction, a four

INFORMATION FREE

For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 163.



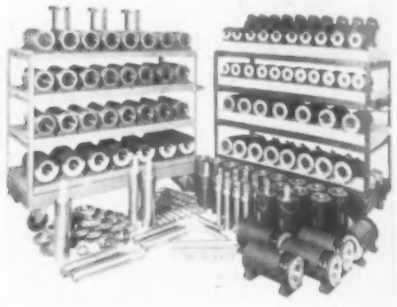
HydroLectric Motorized Lift Truck
Features patented finger control.

wheel construction, a balanced handle, a finger tip control, and a cost of [illegible] per day for power.

CARTRIDGE CASE INSPECTION GAGES (J76)

Through contact with a number of cartridge case producers, The Quality Tool and Die Company of Indianapolis, Indiana, has discovered some of the problems of this industry in the inspection of its product and is offering a new service to these producers.

This survey showed a need for a re-



Cartridge Case Inspection Gages
Said to be approved Government design.

liable source to give gages a periodic inspection to ascertain whether or not they are within the safe limit of tolerances specified. It is also said that a source was needed which would offer a reconditioning service on these gages used in cartridge case inspection.

The following services are now being offered by this concern to help solve these inspection problems: All types of required gages for cartridge cases are said to be made to approved Government design. A reliable inspection service, consisting of a thorough examination for damaged gaging members, stoning of nicks and burrs from functional surfaces, and inspection for dimensional errors due to wear or misuse, is included.

If the gages are found to be worn to such an extent that they must be reconditioned, the customer is notified as to the findings and the amount which will be required to put gage in proper working condition.

If, in this inspection process, the gages are found to be within their allowable tolerances, they will be returned to the user, properly tagged with the findings and the O. K. THE END.

For the Latest News on New Literature for Mass Manufacturing, Please Turn to Page 188.

TANNEWITZ *HIGH SPEED* METAL CUTTING BAND SAWS

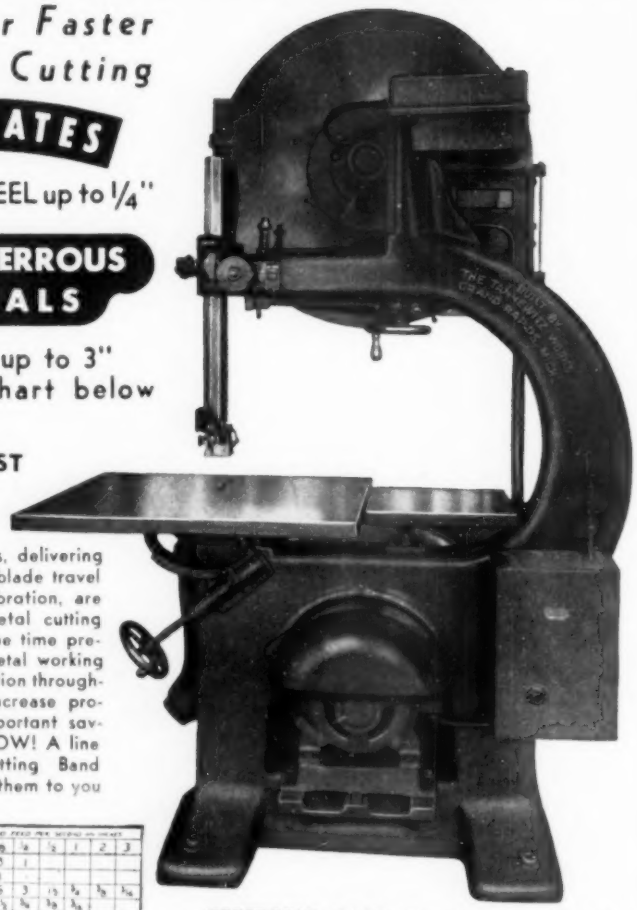
. . . a far Faster Means of Cutting

TEMPLATES

from SHEET STEEL up to 1/4"

NON-FERROUS MATERIALS

of all kinds up to 3" thick — see chart below



SAVE THEIR COST IN SHORT ORDER

These superb machines, delivering over two miles of saw blade travel per minute without vibration, are doing hundreds of metal cutting jobs in a fraction of the time previously required, in metal working plants of every description throughout the country. To increase production and make important savings get the details NOW! A line requesting Metal Cutting Band Saw Bulletin will bring them to you promptly.

KIND OF MATERIAL	Thickness and feed per minute in inches							
	1/32	1/16	1/8	1/4	1/2	1	2	3
Mild Steel	32-24	6	3	1				
Stainless Steel	6	2	1					
Yellow Brass Zinc	24	12	6	3	1 1/2	3/4	1/2	1/4
Bronze or Copper	6	3	1 1/2	3/4	3/8	3/16		
Aluminum	24-16	16	9	4 1/2	2	1 1/2	1	3/4
Duraluminum	24	12	6	3	1 1/2	1	3/4	1/2
Single Plymetal				6	4			
Double Plymetal				4	3			
Plywood	24-16	24	20	16	12	6	3	1 1/2
Asbestos Board	12	6	3	1 1/2	3/4			
Fibre (Hard)	24	12	6	3				
Paper Board	24	18	12	4	2	1		
Masonite	24	18	12	6	3	1 1/2	3/4	3/8
Bakelite	12	6	3	1 1/2	3/4	3/8	3/16	

PERFECTLY SAFE: Two-wheel Lockheed Hydraulic Brakes automatically and instantly stop the wheels in case of saw blade breakage—completely guarded.

Incorporated in Tannewitz High Speed Band Saws are many highly developed, patented features found in no other band saws.

Made by Sawing Machinery Specialists

THE TANNEWITZ WORKS, GRAND RAPIDS, MICH.

6,000 R.P.M.

150" FEED PER MINUTE

Vega Aircraft reports this actual performance of **Grayson Cemented Carbide milling cutters,** on aluminum. With a 6" Staggered-Tooth mill (actual-size photograph above), a surface speed of **9,425 feet per minute** was attained, with a cut 1 ⅛" deep and ⅜" wide. And, after a long run, microscopic observation of the carbides showed no ill effect.

Naturally, such speeds and feeds are beyond the capacity of most machines. But this gives some indication of the possibilities of milling with **Grayson** cutters. Charts for speeds and feeds, on metals from **aluminum to 4340 chrome-nickel,** are provided with cutters, to help machine operators obtain maximum results.

Grayson Manufacturing Company

MONROVIA, CALIFORNIA

TALCOTT BUILDING, ROCKFORD, ILLINOIS

NEW LITERATURE . . . . . .

T.M. REG. U.S. PAT. OFF.

Of Interest to Production Executives

(602) Abrasive Cutting

Abrasive Cutting. 32 pp. Andrew C. Campbell Division, American Chain & Cable Company, Bridgeport, Conn. Explaining the development and application of abrasive cutting, this new booklet contains details, photographs, and tables about the operation of abrasive cutting machines. It follows the development of these machines from the dry abrasive cutting machine to the most modern wet abrasive cutting machine.

(603) Milling Attachment

Halco Universal Hi-Speed Head. 4 pp. Ajax Engineering & Manufacturing Company, 14230 Birwood Avenue, Detroit. This new folder discusses the various construction features of this attachment for milling, drilling, boring, and counter boring. Photographs show the various parts of the attachment and the different working angles made possible by this attachment.

(604) Internal Wrenching Bolts

N.A.S. Standards for Internal Wrenching Bolts. 16 pp. The Holo-Krome Screw Corporation, Hartford, Conn. Directed primarily to aircraft designers and engineers, this new catalog lists the standards for internal hex. wrenching bolts developed by the National Aircraft Standards Committee. Each table of standards is set in readable type with the corresponding diagram at the top of each table. Material and finish specifications are also given.

By using KENNAMETAL tools for machining High Brinell steels it is not first necessary to reduce the hardness of the work piece, complete the machining, then reharden the job for the finished product; KENNAMETAL will cut right through steels up to 550 Brinell.

KENNAMETAL is a fine-grained carbide cutting tool that will not gall or crater from hot chips consequent to machining hardened metals. High Brinell steels demand a hard cutting material; KENNAMETAL has a Rockwell C hardness of 77.6, Rockwell A 90.8 and has a transverse rupture strength of 305,000 lbs. /sq. inch.

KENNAMETAL CUTS 1¼ MILES OF HARDENED STEEL IN 80 MINUTES

The illustration shows a Style 11 KENNAMETAL tool machining high carbon steel (401-427 Brinell) at a speed of 80 feet/min. at a feed of .032"; depth of cut 0 to 1". The tool cut 1¼ miles of this hardened metal before regrinding was necessary.

KENNAMETAL not only cuts hardened steels which ordinary carbides cannot machine—it consistently increases production on steels of any hardness. Use it for all your steel boring, turning, and facing operations; there is a tool for your particular application.

Write for your copy of the new KENNAMETAL Catalog No. 43.

*** INVENTED AND MANUFACTURED IN U.S.A.**

KENNAMETAL THE All American CARBIDE

McKENNA METALS Co.
600 Lloyd Avenue, Latrobe, Penna.
Foreign Sales: U. S. STEEL EXPORT CO., 30 Church St., New York
Exclusive of Canada and Great Britain

INFORMATION FREE

To receive the booklets listed in this section, list the key number found on the heading of the desired literature and your name and address on the postcard coupons—page 163.

(605) Duplimatic Control

Cast Armor Tank Turret Door Openings and Doors Automatically Milled to Size. 2 pp. Detroit Universal Duplicator Company, 723 East Milwaukee Avenue, Detroit. This new bulletin discusses the automatic production milling of cast armor tank doors and door openings. It describes and illustrates how the path of the cutting tool on a heavy duty post-type boring mill is controlled by Duplimatic.

(606) Presses

HPM Fastraverse Metal Working Presses. 12 pp. The Hydraulic Press Manufacturing Company, Mount Gilead, Ohio. This booklet describes and illustrates the different types of presses in this grouping. In each case pictures are included showing operators at work at the various jobs done by the machine. A line drawing shows the H-P-M "closed circuit" system for fastraverse press operation. Press standards, sizes, and pressures are given.

(607) Roll and Cylindrical Grinders

Farrel Roll Grinder with Traveling Work Table. 32 pp. Farrel-Birmingham Company, Inc., Ansonia, Conn. This new

(Continued on page 190)

"*Hand Tools* are taking a terrific beating in the war factories. WPB estimates that because of *improper use*, the life of 75% of such implements is being greatly reduced."
—NEWSWEEK

FACED WITH THIS *Problem?*

THIS *FREE* BOOKLET WILL HELP YOU

THE Cleco Cartoon Book presents, in a series of amusing cartoons, many useful hints for the proper care of pneumatic tools. It's full of practical do's and don't's telling how to get more work out of your tools, with minimum expense for repairs and compressed air. Your men will like the down-to-earth shop-talk used in this booklet. We have already had requests for thousands of copies. In the interest of efficient war production, write now for your free copy.

A TYPICAL **CLECO** CARTOON

LUBRICATION—Proper lubrication is most important. Each morning, and at noontime, the operator should inject a few drops of Cleco "Never-Gum" oil, or other high-grade light machine oil, into the hose connection, unless an efficient air line lubricator is being used. Under conditions of continuous operation, the tool should have a few drops of oil every hour. Caution: If too much oil is used, or too heavy a grade, the tool will be sluggish.

THE CLEVELAND PNEUMATIC TOOL CO.

3781 East 77th St. *Branch Offices in All Principal Cities* Cleveland, Ohio

booklet describes the design, construction, and operating advantages of this roll grinder. It conveniently tabulates specifications, dimensions, and weights for the different sizes of this type of machine. It is illustrated and descriptions of the standard equipment, optional attachments, and electrical equipment requirements are included.

(608) Taps

Detroit Tap Catalog. 134 pp. Detroit Tap and Tool Company, Detroit. In addition to giving specifications and prices of this concern's line of standard and special taps, this new catalog gives details on thread milling cutters, thread gages, and other forms of threading tools. It also contains numerous reference tables said to be of daily use to the shop man and production engineer. Details are also given on the tap reconditioning machine made by this concern.

INFORMATION FREE

To receive the booklets listed in this section, list the key number found on the heading of the desired literature and your name and address on the postcard coupons—page 163.

(609) Diamond Wheels

Secomet Diamond Wheels — How to Use Them. 12 pp. J. K. Smit & Sons, Inc., New York. This new illustrated booklet contains important hints and tips on the proper use of these special tools. Methods of mounting, coolants, speeds, and dressing as well as pointers on various types of grinding are described.

(610) Induction Heating

Faster Production with Tocco. 16 pp. The Ohio Crankshaft Company, Cleveland, Ohio. This booklet describes Tocco operating principles in hardening, brazing, annealing, and heating metal. In addition to various diagrams and photographs of actual applications, this booklet also shows various units of the latest junior machines with a complete listing of their specifications.

(611) Grinding Machines

Dumore Precision Grinders. 36 pp. The Dumore Company, Racine Wisconsin. This new catalog lists more than 15 tools, each carefully segregated to select the correct accessories for each tool. Each grinder is illustrated and the principal dimensions are given in outline drawings. Grinding quills are illustrated and the range of work that can be handled is specified. Application pictures are included and a cross-sectional drawing shows the internal construction of the grinders.

(612) Gage Block Care

How to Make Your Standards Last Longer. 8 pp. Dearborn Gage Company, Dearborn, Michigan. This illustrated booklet tells the user of gage blocks how important it is to take proper care of them. To insure longer wearing millionths, this concern explains how a special flat surfaced stone is used to keep the gage block surfaces free from burrs or scratches.

(613) Gears

Red Ring Rotary Shaving Produces Instrument Gears with zero. Backlash in Less Than a Minute. 8 pp. National Broach and Machine Company, 5600 St. Jean, Detroit. Describing a method of finishing small gears, this new booklet gives the specifications of the fine pitch gear shaving machine manufactured by this concern. The machine and its parts are illustrated and the general features, operating principle, cutter head, table,

(Continued on page 192)

DOUBLE THE TOOL LIFE
at Half the Tool Cost!

WITH SUTTON MASTER FEED FINGERS AND INTERCHANGEABLE AND REPLACEABLE PADS

One master and different sets of pads will handle practically the full range of work on any machine, and worn out pads can be quickly and easily replaced in the original master. This cuts your tool cost as much as 80%. But, since the pads are separately hardened, to resist wear, and can be ground many times to restore size, they outlast ordinary one-piece feeders two or three times.

NO PINS OR SCREWS TO WORK LOOSE. A lug on one of the pads engages a slot in the master; there are no pins or screws to vibrate loose and jam the machine.

COMPENSATION FOR WEAR—Double angles on the sides of each pad can be ground down many times to restore hole size, the tension of the master bringing the pads together.

TAPERED FOR STOCK ENTRY—Master and pads are tapered to admit stock easily—no jamming.

QUICK, EASY PAD CHANGES—Each master is furnished with a set of spreaders, one for each slot, which allow fast interchange of pads.

SELECTIVE HEAT-TREATMENT—The threaded end of the master is toughened . . . the remainder is spring-tempered. The pads, being separate, can be hardened for extreme wear-resistance.

COLLETS • MASTER COLLETS AND PADS
FEEDERS • MASTER FEEDERS AND PADS
PARTS AND ACCESSORIES for lathes . . . milling machines . . . and automatic screw machines.

SUTTON TOOL COMPANY
2895 W. Grand Blvd. • Detroit

SEE YOUR SUTTON REPRESENTATIVE or send for Catalog No. 15

SUTTON Diamond Grip **COLLETS**

Increase "Eye Efficiency"

with

STANLEY "FLUD-LITE" MAGNIFIERS

TRADE STANLEY MARK

Floodlights the work area with glare-free fluorescent light.

Magnification prevents eye-strain and lessens worker fatigue.

Saves man-hours, speeds production.

Reveals the finest details.

SPEED UP INSPECTION . . . ASSEMBLIES

Those time-consuming, eye-fatiguing jobs can now be speeded up to meet today's demand for record production . . . with Stanley "Flud-Lite" Magnifiers. A flood of "natural" light on the work, plus the high quality 5" diameter lens, increases the "eye efficiency" of inspectors, assemblers, machinists and toolmakers. The tiniest cracks, scratches, and other flaws in machined parts are quickly revealed. Reamers, gauges, punches, dies, etc., can be checked at a glance.

THE FLUORESCENT DAYLIGHT LAMP

illuminates every detail of the work with shadow-free natural light. It generates little heat, and its current consumption is very low. Operates from any 110-120 volt A.C. outlet.

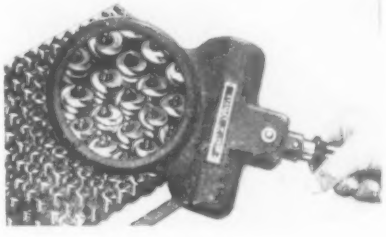
The "Flud-Lite" Magnifier is also an invaluable aid in map making and reading, engraving, counterfeit detection, fingerprint inspection, and other work where magnification is required. Men and women who can see better do better and faster work.

No. 701, above, is the bench type "Flud-Lite" Magnifier. Swivel joints permit adjustment to any desired position. Base is removable to allow permanent attachment in any location.

• • •

Ask your Stanley Distributor about "Flud-Lite" Magnifiers. Literature sent on request. Stanley Electric Tool Division, The Stanley Works, New Britain, Connecticut.

No. 701H, at the right, is the portable type "Flud-Lite" Magnifier. It permits inspection anywhere in the plant, inside machines, and other hard-to-reach places. Fitted with a comfortable grip, hardwood handle and six feet of approved cable.



STANLEY

Electric Tools

and base are described in detail.

(614) Motors
Lima Gearshift Drives. 6 pp. The Lima Electric Motor Company, Lima, Ohio. This new folder shows both the direct motor type of drive and the belt type of drive manufactured by this concern. One feature of the folder is a group of pictures which show these drives in operation on various machines. Gearshift action is illustrated and described. Descriptions and illustrations of a polishing lathe and all-purpose motors are also included in the folder.

(615) Cutting Tools
Standard Cemented Carbide Tipped and Special Cutting Tools of all Types. 32 pp. Wendt-Sonis Company, Hannibal, Missouri. This new indexed catalog gives illustrations and specifications on the various centers, drills, counterbores and spotfacers, end mills, hollow mills, lathe bits, reamers, and special tools manufactured by this concern.

(616) Welding Positioners
Ransome 20 Ton Capacity Welding Positioners. 4 pp. Industrial Division, Ransome Machinery Company, Dunellen, New Jersey. A complete description of the positioner is given in this folder and the advantages explained. The folder not only illustrates this size positioner, but also shows various other size positioners manufactured by this company. Complete specifications are also included.

(617) Lubrication
Graphite Lubrication Handbook. 28 pp. Nassau Laboratories, Hackensack, N. J. This new handbook lists the various products supplied by this concern and explains the work which graphite performs. Also included is an indexed list of applications which is said to be helpful to the lubrication engineer.

(618) Coated Abrasive Gadget Chart
Metalite Cloth Gadgets Speed Sanding. Behr-Manning Corporation, Division of Norton Company, Troy, N. Y. This new wall chart describes and illustrates numerous types of abrasive cloth gadgets developed as specialties by this concern for metal finishing and polishing operations that could not be performed conveniently by other tools. Illustrations also show a few examples of the type of work these gadgets are doing to help speed up production where portable or flexible shaft machines are used.

(619) Testing
Automatic Stress-Strain Recording. 20 pp. The Baldwin Southwark Division of the Baldwin Locomotive Works, Philadelphia. Said to be useful to engineering and laboratory staffs in many industries, this new booklet includes a section on the specification data of the Army and Navy. Other sections give a summary of requirements for testing war material; an interpretation of the stress-strain curve; and detailed descriptions of the recorders and accessory extensometers. The booklet is illustrated with charts, tables, and photographs.

(620) Superfinishing Machines
Foster 4 by 18 inch and 4 by 36 inch Capacity General Purpose Superfinishers. 28 pp. International Machine Tool

(Continued on page 194)

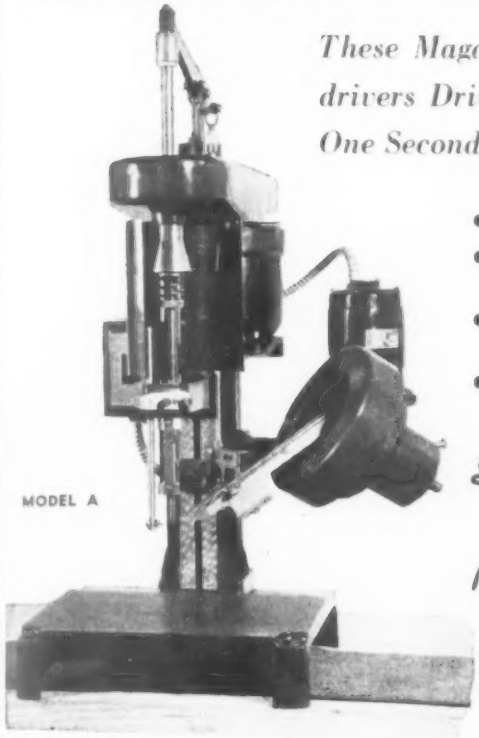
INFORMATION FREE

To receive the booklets listed in this section, list the key number found on the heading of the desired literature and your name and address on the postcard coupons—page 163.

A Typical Installation of 45 LIMA Drives
A Few of the Concerns We Serve
Packard Motor . . . Chrysler Corp. . . . Pratt & Whitney . . . Carrier Corp. . . . Lima Locomotive Works, Inc. . . . Norfolk Navy Yard . . . Edgewood Arsenal . . . Ryerson & Son . . . The Ohio Steel Foundry Co. . . . General Motors . . . Foote Gear Works . . . American Can . . . Studebaker Corp.
Your production too can be expedited by installing LIMA Gearshift Drives . . . wire or write for address of the Lima Engineering Service nearest you.
★ Buy War Bonds for Quick Victory ★
Large enough to successfully serve you, yet small enough to give personal attention to your needs.
THE LIMA ELECTRIC MOTOR CO.
OFFICES - NEW YORK - CHICAGO - DETROIT
LIMA, O. U. S. A.
DRIP-PROOF 1 to 75 HP
EXPLOSION-PROOF 1 to 5 HP
POLISHING LATHES
OPEN
VERTICAL
TOTALLY-ENCLOSED

PRODUCTION DEPENDS ON RELIABILITY OF MACHINES

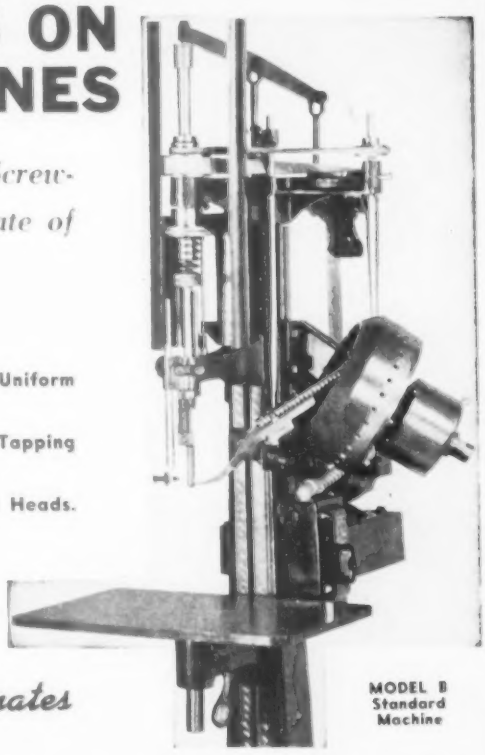
These Magazine Feed Power Screwdrivers Drive Screws at the Rate of One Second Per Screw.



MODEL A

- No Marring of Heads.
- All Screws Driven to a Uniform Tension.
- Machine, Wood, Self Tapping Screws.
- Standard Heads, Special Heads.

Send Samples for Production Estimates

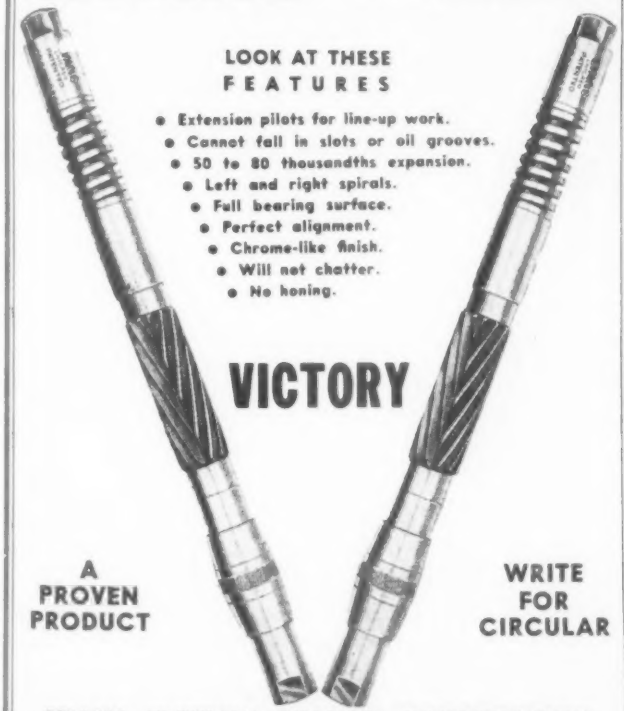


MODEL B Standard Machine

DETROIT POWER SCREWDRIVER CO.

2805 W. FORT STREET DETROIT, MICHIGAN

EVANS HIGH SPEED STEEL REAMERS



LOOK AT THESE FEATURES

- Extension pilots for line-up work.
- Cannot fall in slots or oil grooves.
- 50 to 80 thousandths expansion.
- Left and right spirals.
- Full bearing surface.
- Perfect alignment.
- Chrome-like finish.
- Will not chatter.
- No honing.

VICTORY

A PROVEN PRODUCT

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EVANS FLEXIBLE REAMER CORPORATION

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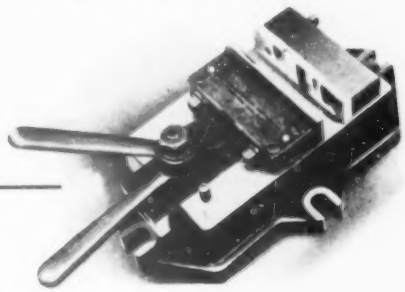
THIS MILLING VISE

Speeds Gripping and Releasing!



POWER, SPEED, STRENGTH, and ACCURACY are obtainable with this Hartford "Four Point" Milling Vise. It features a dual-operation principle of handles which speeds gripping and releasing. The operator can easily apply tremendous power with one hand because both the cam-faced and binding handles can be manipulated at the same time. You get maximum strength because the base is of semi-steel and the movable jaw is single heat-treated steel drop forging. The movable jaw can accurately hold a single piece at either end of jaw because it has ground fitting surfaces. Jaws are in absolute alignment.

WRITE FOR LITERATURE

THE HARTFORD SPECIAL MACHINERY CO.

HARTFORD, CONN

Corporation, Foster Division, Elkhart, Indiana. This new catalog gives an illustrated comparison of various types of surfaces including turned, ground, honed, refined ground, and superfinished. Illustrations also show the various stages of superfinishing. Copies of the brush recordings of normal ground surfaces and superfinished surfaces are shown. There are also many photographs of the machines and attachments.

(621) Tools

Dependable Punching and Cutting Machines, Benders, Punches, Dies, Shear Blades, Special Tools. 80 pp. T. H. Lewthwaite Machine Company, 311 East 47th Street, New York. This complete catalog illustrates, describes, and gives the specifications of tools sold by this concern.

(622) Slotter

Universal Double Duty Slotmaster. 4 pp. Experimental Tool & Die Company, 12605 Greiner Avenue, Detroit. This new folder describes the Universal Slotmaster and includes illustrations and detailed information regarding 6 different set-ups on this machine. Said to be adaptable to any round or flat-on round milling machine, the machine is shown in just a few of the actual set-ups it can handle.

(623) Grinding Accessories

Time-Saving Devices for the Grinding Room. 8 pp. The George Scherr Company, 128 Lafayette Street, New York. Included in this new folder on time-saving devices for the grinding room is a complete description of Magne-Blox products, magnetic parallels used on magnetic chucks for holding work for surface grinding operations, and radius dresser for dressing radii from 0 to 1 inch. Other products made by this concern are also briefly described in this folder.

(624) Furnaces

Despatch Recirculating Furnaces. 16 pp. Despatch Oven Company, Minneapolis, Minn. This is the latest bulletin from this concern on furnaces for heat treating ferrous and non-ferrous metals. It is complete with suggested uses, range of sizes, and construction specifications of standard and special models.

(625) Valve Operators

Type 2 Valve Operators. 4 pp. Automatic Temperature Control Company, Inc., Philadelphia. This new folder lists applications, design features, and functional data on the valve operator. Diagrams and tables supply information on electrical and mechanical details. The folder is illustrated and the general specifications are included.

(626) Centerless Grinding

Centerless Grinding with Sterling Grinding Wheels. 6 pp. The Sterling Grinding Wheel Division of The Cleveland Quarries Co., Tiffin, Ohio. This new folder contains centerless grinding recommendations and a typical specification on wheel marking analysis. The grinding wheels are illustrated and completely described.

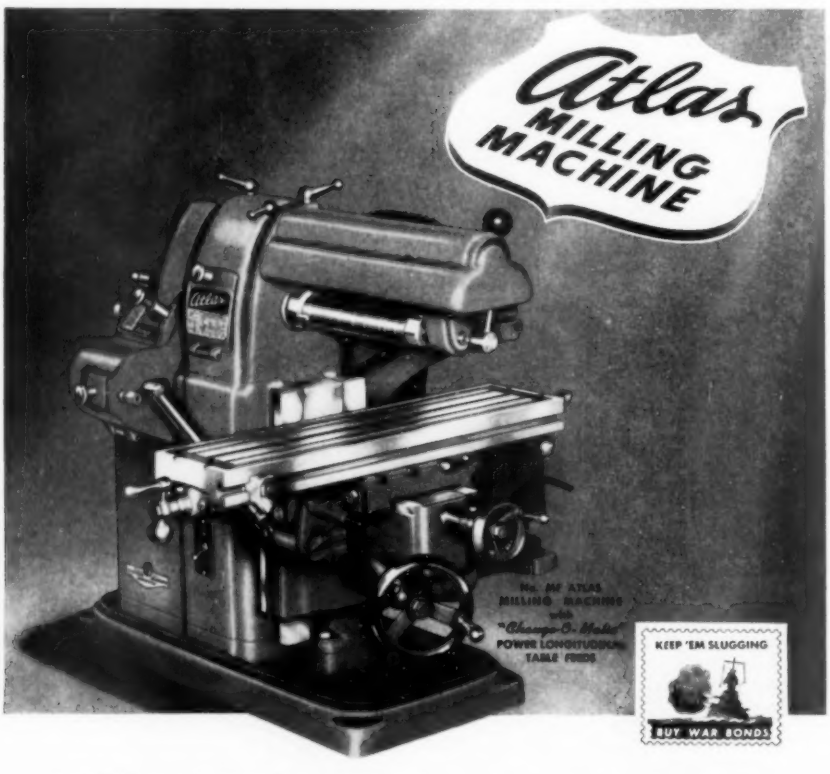
(627) Visual Aid

Visual Aid Catalog of Motion Pictures and Slide Films. 64 pp. The Herbert D.

(Continued on page 196)

INFORMATION FREE

To receive the booklets listed in this section, list the key number found on the heading of the desired literature and your name and address on the postcard coupons—page 163.



"MATCH THE MACHINE TO THE JOB — use fast precision bench tools to take over the production of small parts so that capacities of larger machines will not be wasted." That Atlas idea is helping thousands of plants, large and small, step up production in the victory program. And an important tool in the production drive is the Atlas Milling Machine.

HERE is a real bear for precision work — rugged, compact, powerful. It handles the full range of milling — from slabbing and facing cuts to end milling, keyways, finishing and layout work. It has backgeared power, complete V-belt drive, 12 spindle speeds, and operates from a 1/3 HP 1740 RPM motor. Precision-ground table is 4½" x 18". Three types of table controls are available. Send for complete information to the Atlas Press Co., 104 N. Pitcher St., Kalamazoo, Mich.

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OTHER ATLAS EQUIPMENT FOR WAR PRODUCTION

LATHES Backgeared, screw-cutting lathes with V-belt drive, power cross feed.

SHAPERS Handle all work within a 7" stroke accurately, quickly.

DRILLING MACHINES Step up production on small-hole drilling, tapping, 4, 3, 2-spindle models.

The Improved Nielsen Live Centers

LOAD CAPACITY—200 TO 40,000 LBS. AT 100 RPM.

HAVE ADJUSTMENT TO TAKE UP WEAR AND PRELOAD BEARINGS

STANDARD MORSE TAPER No. 2 TO 6 IN STOCK

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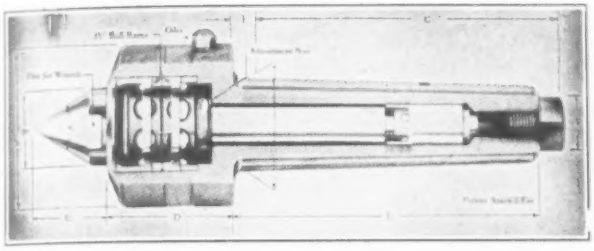

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contain a number of small, whole diamonds which may be completely consumed without resetting. While they are mainly intended for finish grinding, they may be used on wheels of any size and hardness. Catalog on request.

J. K. SMIT & SONS, INC.
157 Chambers Street, New York

For Faster-Better *TOOL and DIE Making*

FRAY MICROMETER OFFSET Boring Heads

- Guesswork is eliminated and work speeded with the exclusive retainer ring design of FRAY Offset Boring Heads. This ring gives all the advantages of round construction with full strength and complete safety. Eliminates outside corners—keeps chips out of micrometer.
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FRAY MACHINE TOOL CO.
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Makers of "All-Angle" Milling Machines & Milling Attachments

SECOMET Resinoid Bonded Diamond Wheels can do your work more accurately, faster and without appreciable wear. They are most economical for sharpening cemented carbide and multi-bladed tools, such as milling cutters, broaches, etc. Moreover, their sharp, free-cutting action eliminates lapping and the usual semi-finish grinding operation. Catalog on request.

Prompt deliveries

J. K. SMIT & SONS, INC.
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Hall Foundation, 1060 Broad Street, Newark, N. J. This catalog lists only educational and training motion pictures and slide films. Each film is indexed according to the subject matter covered. Number of reels, sponsor of the film, and descriptive paragraphs on each film are included in the booklet. Also mentioned is information on the distribution of these films.

(628) Welding Rods

Substitute for Scarce Bronze or Brass Welding Rods. 2 pp. Eutectic Welding Alloys Co., 40 Worth Street, New York. This bulletin describes the substitute found by this concern for bronze welding rods. It features a list of comparisons of the procedures for bronze welding and for Castolin Eutectic welding and its claimed advantages.

(629) Cutting Tool Power Requirements

Motorule for Calculating Cutting Tool Power Requirements. General Electric Company, Schenectady, N. Y. This newly developed load calculator is said to simplify the computing of motor horsepower required for metal cutting operations on various machine tools. Designed along the lines of an engineer's slide rule, it is said to be applicable to a wide range of materials and accurate for a wide variety of cutting operations on lathes, drills, planers, and milling machines.

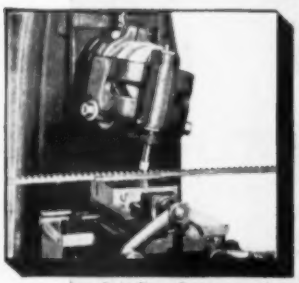
(630) Alloys

A New Series of Weldable Alloys for Tipping Metal Cutting Tools. 4 pp. Wall-Colmonoy Corporation, Fisher Building, Detroit. Describing and illustrating Colmonoy WCR alloys, this new folder shows four steps in fabricating a typical tool with this alloy. The four different grades of this alloy are listed and described.

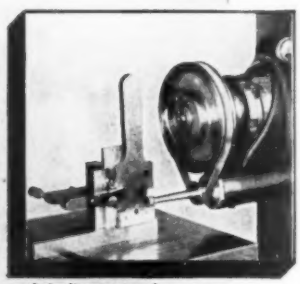
INFORMATION FREE

To receive the booklets listed in this section, list the key number found on the heading of the desired literature and your name and address on the postcard coupons—page 163.

LIBERTY High Speed Grinding Attachments



Grinding clearance of broach teeth.

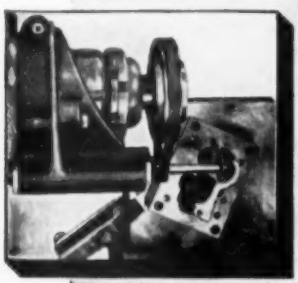


Grinding gage in perfect alignment with other points.

Both horizontal and vertical types are easily attached to most surface grinders for grinding angles, slots, recesses and surfaces which are impossible to reach with large grinding wheels.

For extremely accurate grinding on gages, tools, dies, etc. Assembled complete with any size bores, pulleys, belts and grinding wheels at no extra cost.

***Write for details*— specifying diameter of spindle head, type and make of grinder.**



Grinding punch form.

Grinding shoulder on punch.

LIBERTY TOOL & GAGE WORKS

235 Georgia Ave. **Providence, R. I.**

Grinding rectangular opening in trigger casing.

Grinding gaging seat on special gage.

NEW BOOKS

Mechanical Drawing by Ervin Kenison and James McKinney, revised by Tom C. Plumridge. 330 pp. $2.00. American Technical Society, Drexel Avenue at 58th Street, Chicago. Developed as a training book for extension students, this new book is divided into 14 sections with problems and exercises appearing at the end of each section. It contains 402 pen and ink drawings. Contents include instruments and materials, lettering, geometrical definitions and problems, symbols and conventions, working drawing principles, projection, hidden parts, sections and drawing to scale, working drawings and rules of projection, intersections, developments, and isometric and oblique projection.

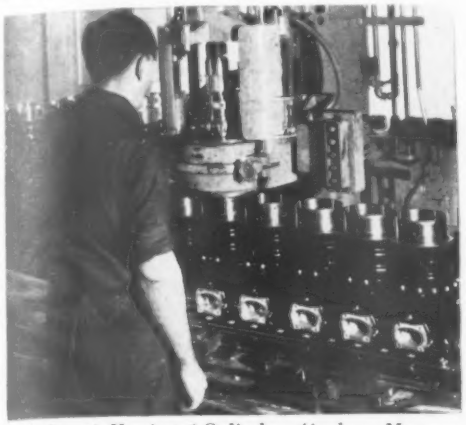
Machine Speeds and Feeds compiled by Hayward-Tyler & Company, Ltd. 132 pp. $2.25. Chemical Publishing Company, Inc., 234 King Street, Brooklyn, New York. Including 19 tool form charts, this new book is a collection of tables and data on machining operations where cast iron, steels and alloy steels, aluminum, aluminum alloys, and other non-ferrous metals are being used.

The tables in this book have been compiled for the guidance of machine operators who are working on new jobs or new materials. Highest possible figures are not given.

THE END

over 8 Metal-Working Results from Two Machines . . .

● BARNESDRIL honing machines offer four distinct metal removal features from one process. Honing removes stock faster after rough boring than size boring and reaming. It removes surface defects and inequalities. Final size is achieved through accurate control of hone pressures. Both roundness and straightness of bore are developed with *controlled* hones.

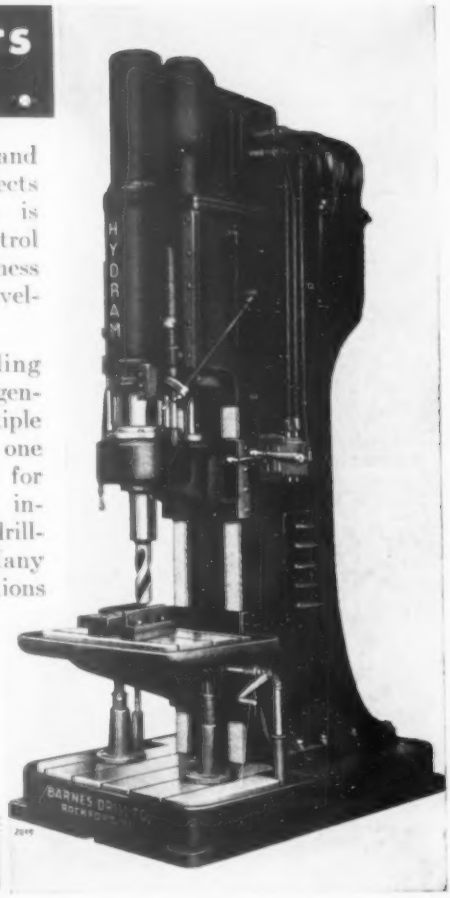


(Above) Honing 6-Cylinder Airplane Motor Blocks.

BARNESDRIL Hydram Drilling Machines can be furnished for general purpose drilling using multiple speeds and feeds, or, with one speed and multiple spindles for production drilling, or with inverted spindle for deep hole drilling, or for boring operations. Many other special tooling applications available.

Consult our engineers on your honing and drilling problems . . . no obligation.

FREE DATA: Write today for specifications and data covering the complete line of BARNESDRIL equipment. Ask for Bulletin T.



(Right) Vertical 4-H Hydram Drilling Machine with 4" Twist Drill.

Barnes Drill Co. 848-71 CHESTNUT ST. ROCKFORD ILLINOIS, U.S.A.

Columbia TOOL STEEL

READY TO SERVE YOU—

Competent assistance in the selection and use of tool steel for the many new tasks in the war effort is available.

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It pays to use Good Tool Steel.

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Stuart's "SUPER-KOOL" BASE OIL

America's First Transparent Sulphurized Metal Working Lubricant

. . . for tough jobs like Cold Nosing Shell and Drawing Booster Cups

THIS extra heavy-duty deep drawing lubricant is in wide use today — achieving important production improvements on difficult forming operations. If you have a problem it will pay you to try Stuart's "Super-Kool"—order a trial drum today with a guarantee of 100% satisfaction or 100% credit. Send work details for application directions.

For All Cutting Fluid Problems

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Warehouses in All Principal Metal Working Centers

HANDY ANDY says:

T.M. REG. U.S. PAT. OFF.

HAVE HAD TOO MUCH MAIL, of late, to answer it along with chores of writing. However, I'll comment on a few billy doos at random, taking them as they come to mind. Warren Ames, of Waltham, wrote me a testimonial regarding my good behavior while in Boston, suggested that I show it to the Old Man. I did, and he said that was what he was afraid of—that I'd behaved myself.

You know, I owe that Boston gang a great debt. Used to have headaches all the time, and I haven't had one since Oct. 7, the day I left Detroit for the east. No more does the train say Bromoseltzerbromoseltzerbromoseltzer. For me, oysters and Boston sckrod. Thanks a lot!

Also had a letter from Ed Dickett, inviting me to Rockford — one of the few remaining strongholds of the Swedes, as I get it. Well, I may take him up on that, still being able to say Skoal in the native although my style may be somewhat cramped now that OPA has banned vests. You're supposed to touch the third button, but the book of etiquette says nothing about zipper sweaters.

Gene Bouton, too, sent me a note along with a clipping about one H. W. McGee, A. O. Smith engineer who, according to the item, had various misadventures with a Stanley steamer with which he'd decided to bridge the *Age of Ration*. But really, I don't know the A. O. Smith boys well enough to rib em', although I hope to make their acquaintance next March, at Milwaukee. They were competitors of Midland Steel in the days before *cooperation* became the American industrial slogan; at that, I've heard some mighty fine things about them. Anyway, if Mr. McGee doesn't want his Stanley he can wrap it up and send it to me. I've got ideas about that car.

▲ ▲ ▲

I HAVE ONE missive that I've been puzzling over since October. I know it's from F. Martindell because the letterhead says so. And at long last I make out: "I hope you can read this". With that as a clue, I interpret it as an account of the Chicago October meeting. Seems that Ot Winter talked about his experiences in Russia (you ought to hear Paul Darling tell *his!*) which is a right timely topic now that the Reds have made Hitler's dream of annexation *kaput*. Anyway, I don't know whether the story got into Chapter doings or not; if not, I'll take the rap along with a dose of my own medicine. Never thought anybody could beat my handwriting, but it looks now as if we better put Mr. Martindell on the Editorial Committee. We'd have a great time exchanging notes. (Come right back, Ol' Timer — I like it).

▲ ▲ ▲

AMONG OTHER THINGS, I have a copy of a letter from Len Rosier to Jack Schiller of Greater New York, Len writing from Brazil, where he's been installing the "biggest batch of American machine tools ever to cross

(Continued on page 200)

SPEEDALOY
TOOL BITS and TIPPED TOOLS

WHAT IS SPEEDALOY? SPEEDALOY is a cast, cutting material made up of special tungsten chromium alloy. It fills the breach between high speed steels and tungsten carbides in both performance and price.

WHAT DOES SPEEDALOY DO? SPEEDALOY wears longer than high speed steel and resists shock more than tungsten carbides. It will machine all materials except manganese steel and chilled iron. It should be run faster with about the same depth of cut and feed as high speed steel—thus increasing production 25 to 75%.

SPEEDALOY has proven exceptionally effective on stainless and other nickel or chrome alloy steels.

SPEEDALOY can be supplied in tool bits, flats, and a wide variety of tipped tools available for immediate delivery.

LITERATURE ON REQUEST

CIRCLE TIP TOOL CO.

65 COLDEN STREET • NEWARK, NEW JERSEY

INCREASE TAP LIFE 1000%

with the Blake Tap Grinder

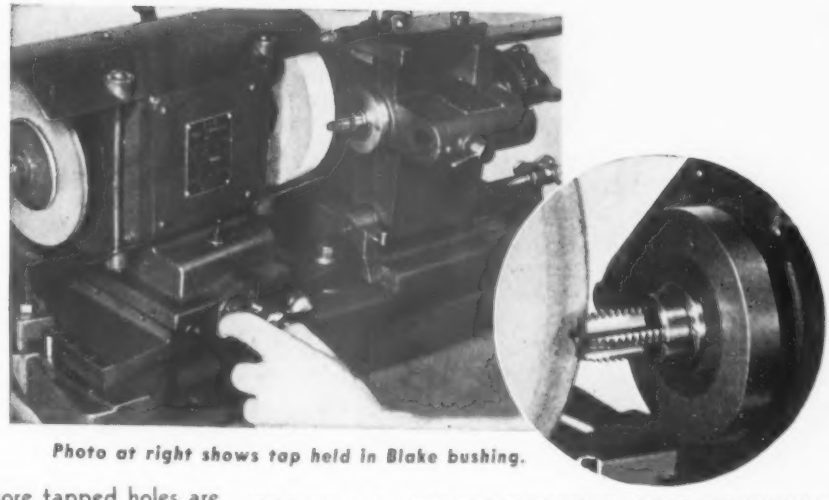

Photo at right shows tap held in Blake bushing.

Dull taps are not scrap taps when you have a Blake Tap Grinder on the job. This machine sharpens taps on the chamfer so that from 2 to 10 times more tapped holes are obtained from taps that formerly went on the scrap pile.

You **profit four ways** with the Blake (1) you conserve scarce High Speed and Carbon Steels, (2) you increase tap life up to 1000%, (3) you avoid the delay caused by waiting for new tap delivery, (4) you maintain the accuracy of your products.

The Blake Tap Grinder (formerly called the J-B) will grind the chamfer on right- or left-hand taps with 2, 3, 4, 5, 6, 8 and 10 flutes. Capacity—No. 0 to 2".

Many manufacturers are getting added profits from their Blake Tap Grinders by sharpening countersinks and other small tools on this versatile machine.

Please send folder giving complete details on the blake Tap Grinder.

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EDWARD BLAKE COMPANY

624 COMMONWEALTH AVE., NEWTON CENTRE, MASS.

BLAKE TAP GRINDERS — FILTAIRE PORTABLE DUST COLLECTORS — AMERICAN TOOL HOLDERS — BLACK DIAMOND PRECISION DRILL GRINDERS — L & D HIGH SPEED DRILL PRESSES

EASY TO ADJUST! QUICK IN ACTION!

THIS RED-E CAM ACTION GRINDER DOG

MADE IN FOUR SIZES TO TAKE ALL SIZES OF WORK FROM 1/4"-2"

CANNOT SLIP

CONCEALED SPRING HOLDS CAM TO WORK

Write for Catalog E-42

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RAM TYPE No. 7-B

VERTICAL UNIVERSAL MILLING MACHINE

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Used the world over for jig boring, die and permanent mold work, production operations, etc.

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Makers of "All-Angle" Milling Machines & Milling Attachments

the Line." (What say, gang, let's write him some letters! His address is: Leonard F. Rosier, Caixa Postal No. 358, Rio de Janeiro, Brazil. Go to it, now!) And from me, Len, the best of wishes. You say that you're an avid reader of THE TOOL ENGINEER, so here's hoping this issue tickles the cockles of your heart. May you bask in sunshine and the smiles of Brazilian *senoritas*.

Also had various letters and phone calls panning me about that boring tool article of mine in November issue. I either hit the wrong key or got the area of a two-inch bar mixed up with the circumference of a one-inch. The funny part is that I've purposely pulled boners before, just to evoke comment, and nary a peep except polite reminder. But this time it was a real slip, and oh—did I catch it! (Guess I need a tool checker). At that, I enjoyed the ribbing, all of it friendly and proof of critical reading.

In this connection, I might point out that the young fellow who makes my drawings (Sig Kildal, his name is) was handling lingerie and ribbons — er, *impersonally*, if you get what I mean — in a local dry goods store up to the time Hirohito made us mad. You'll have to admit that he's doing right well with a pencil and bowpen. I'm right proud of him.

▲ ▲ ▲

THERE WAS ALSO a sheaf of mail from Bill Young, of Boston, which included all the correspondence to and from OPM (now WPB) Donald Nelson and associates *re*: an idea for exchange of Surplus Stock. As I get it, the idea originated with Walter Pohle, Supt. of Spray Engineering Co., Somerville, Mass. Walter wants to pass the credit to the Society, the inference being that it sponsor the Exchange. Personally, I can't do any more than give it publicity — and my blessings.

However, I might suggest that a similar program has been set up by the Automotive Council for War Production since the correspondence in question started. A good idea, you know, just won't stay under a bushel. Anyway Walter Pohle should worry — he's long since crashed the Hall of Fame in his own bailiwick.

▲ ▲ ▲

THE THING that has puzzled me is why in heckelfelt the Great White Father didn't set up an *Office of Tool Engineering* while he was scrambling up the alphabet. Now there would have been something! At that, it may come to pass, now that there's talk of putting reliable Bill Knudsen back on the job. Back into mufti, Bill! — the country needs your productive wizardy. And say, give this idea of an Office of Tool Engineering the double O, will you? There's really plenty of meat and potatoes to it, and you'll enjoy working with a gang that's for you all the way. We may not be so hot at pants pressing and collective bargaining but we're strong on *cooperation* and collective ideas for boosting production. And that's your dish.

▲ ▲ ▲

FROM ONE THING TO ANOTHER, took a night off and attended Detroit's November meeting, taking a baker's dozen or so of my Midland buddies along. We came to hear a talk on

(Continued on page 202)

Industrial Engineering Service

May Be Just What You Need!

Many a manufacturer in the war industry, faced with production problems arising from new and unfamiliar types of work, has seen his difficulties quickly vanish when he entrusted his problems to American's experienced staff of industrial engineers.

If your production is bogged down for some unknown reason, let us ferret out the trouble. Time was never more precious in the nation's history than at this very moment.

WRITE US!

Outline briefly the nature of your production problem and you will hear from us promptly.

ADECO *American* ADECO

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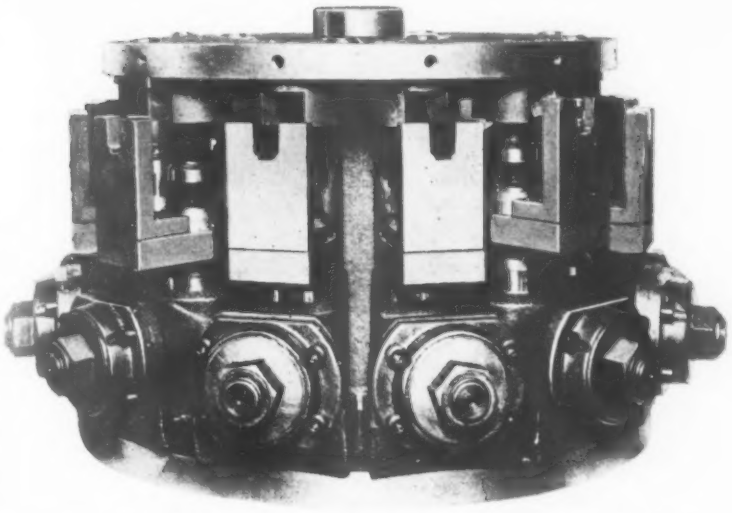

Multiple index fixture to locate and drill hole in boss of brake lever.

REDUCE LOADING TIME WITH SWARTZ LOCKS

COMPACT, POSITIVE CLAMPING

MORE PIECES PER HOUR

ALL LOCK PARTS ARE HARDENED AND GROUND

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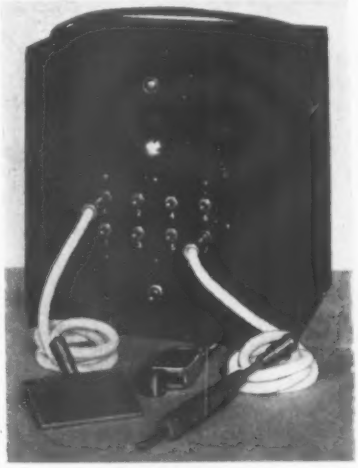
MORE THAN 3000 IN USE



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Buy the Original Electric Etcher

Three sizes to meet all requirements. Also a combined Etchograph and Demagnetizer.

WITH NEW ELKONITE TIP PENCIL

Mark *hardened parts*, tools, dies, gages and fixtures of any ferrous metals including the hardest alloys and carbides — quickly — plainly.

Write for circulars and prices.

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COLBORNE

Speed Lathes

SPEED UP PRODUCTION

USED FOR FINAL FINISHING OPERATIONS

ECONOMICAL POLISHING, LAPPING, BURRING, BURNISHING, FINISHING

OF

GEARS
SHAFTS
DIES
GAGES
BALL RACES
SMALL PARTS
ETC.

Built to meet the requirements of those desiring a heavily constructed, smooth running machine of highest quality.

Has motor in base with variable speed control, using REEVES standard pulley and belt.

Smooth automatic brake acts instantly when switch is thrown. Collets or chuck may be used.

GOOD DELIVERY

MACHINERY BUILDERS SINCE 1879

WRITE FOR DETAILS

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157 W. Division St., Chicago, Ill.

COLBORNE—THE SPEED LATHE PEOPLE

metal cutting, being more than casually interested. And there's still a lot to learn as was brought out during after-meeting rump sessions. Yessirs, plenty, now that they're dumping everything from grandma's corset stays to chilled sadirons into the furnaces. But then, we'll get there eventually.

As usual, met a lot of old friends and acquaintances, among them kindly Ray Brunner, erstwhile Nat'l Secy., sturdy Carl Oxford of Nat'l Twist Drill, and "Hydraulic" Fred Hebert. And Carl Wickland, whom I knew in Providence, but who is now in engineering in Detroit under name of Reliable Engineering Service. Met Ray Wilcox, Detroit's live young editorial ch'man and reminisced a bit with Bill Smila. And with Walter Wagner, of Ford Bomber, reticent as usual but wearing a smug look that augured bad news for Messrs. Hitler and Hirohito.

Also, met Walter Rhodes, (one of my "boys" at Wilbur Wright School last year, when I discoursed on tool engineering) now a tool checker with a local concern. I knew that boy had the goods, and *somebody* overlooked a bet. Some of these young fellows travel fast once they're started.

▲ ▲ ▲

AND NOW, BEST WISHES of the season to old friends and to potential friends North, East, West, South, said wishes being tendered betimes even if belated in arrival. As I write, a gentle snow is falling, harbinger of resort to flannels and other substitutes for the scantier concessions to closed cars and air conditioned homes.

Well, we can take it, being better off by far than our overseas Allies, many of whom would doubtless give their right eye for a mess of this *ersatz* dog food our heretofore pampered pooches have learned to eat, if not like. And as for taxes, we're still below the peace-time cess imposed on the British, so why fret over trifles? We'll take our gas rationing along with other restrictions in force or pending, thereby insuring that our boys at the front, and our Allies who have so courageously breasted the tide, get plenty and on time.

By comparison, we are denied so little, yet, because of that denial we'll be able to give where the giving does the most good. And that's the Spirit of Christmas.

THE END.

EVERY MAN
COUNTS FOR MORE
USING SKILSAW TOOLS!
"Aces in the Hole!"
THAT'S WHAT INDUSTRY CALLS THESE TWO
SKILDRILLS!
HERE is industry's unbeatable pair of production drills—you'll find these two SKILDRILLS in aircraft, tank and war material plants everywhere!
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SKILDRILLS are typical of the entire line of SKILSAW DRILLS. 23 Powerful Models—a size and type for every drilling job. Ask your distributor for a demonstration.
¼ in. SKILDRILL. Only 6¾ in. long; 2 9/16 in. wide. Weighs only 2¼ lbs. Available in 4 speeds (No-Load), 1800, 2500, 3000, 5000 R. P. M.
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A TYPE AND SIZE
FOR EVERY
DRILLING JOB!
SKILSAW PORTABLE ELECTRIC TOOLS
★ MAKE AMERICA'S HANDS MORE PRODUCTIVE ★

—A. S. T. E. DOINGS—

(Continued from page 160)

cember 6. It was a swell meeting with much accomplished. Each member will read the whole story by National Chairman Earl V. Johnson on another page.

Sunday the 13th The Standards Committee met in Detroit with the Executive Committee present. Wow! The Standards Committee is going places and it looks now as though we would soon have the much-to-be-desired Tool Engineering Handbook.

The "Chipper" visited Baltimore Potomac (Washington, D. C.) and Pittsburgh Chapters on December 2 - 3 - 4 and enjoyed each visit tremendously.

THE END.

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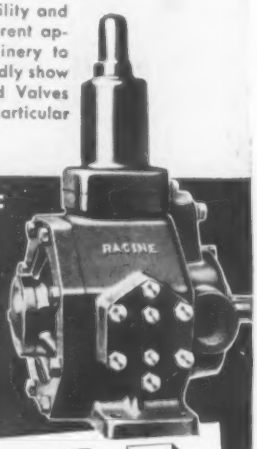
Outstanding among the many features of the *Racine Variable Volume Hydraulic Pump* is its ability to do a time-and-money saving job in an almost endless variety of applications.

Racine Pumps are proving their versatility and efficiency in hundreds of widely different applications ranging from mining machinery to plastic molding. Our engineers will gladly show you how Racine Hydraulic Pumps and Valves can be profitably applied to your particular plant or industry. Write today!



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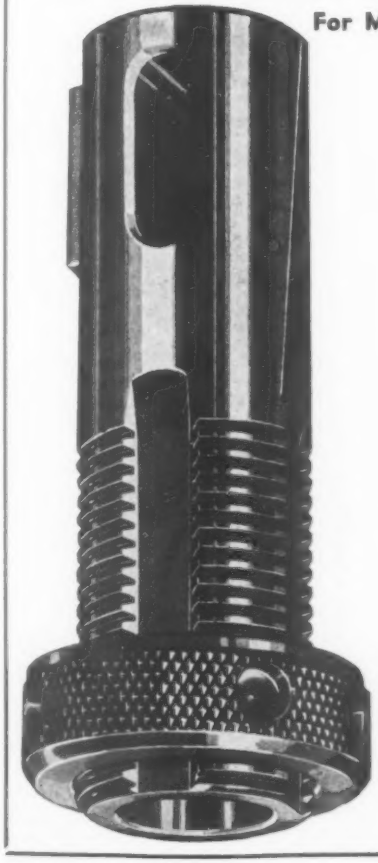
For Multiple Spindles



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- ★ Process Engineering
- ★ Tool Designing
- ★ Plant Layout and Routing
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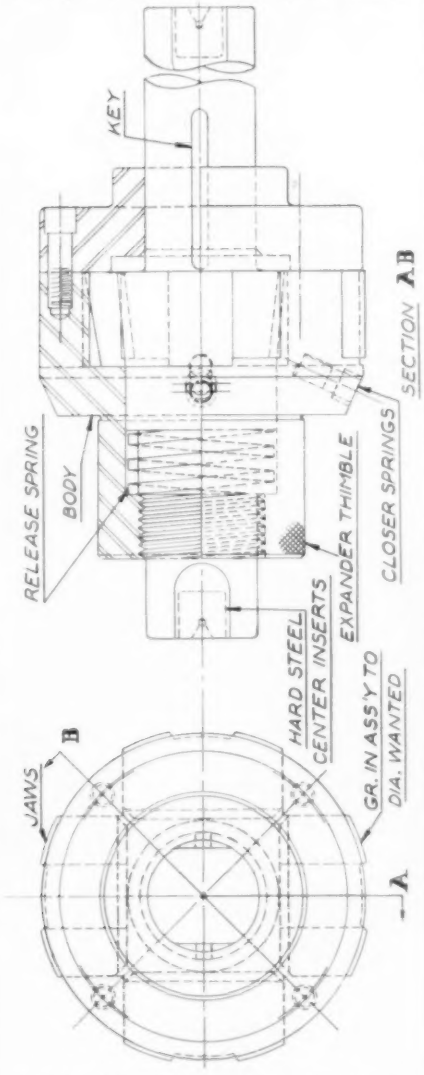
Expanding Mandrel Promises Wide Application

SHOWN IN SCHEMATIC OUTLINE since the job determines specific design, the principle of the expanding mandrel has long been proven in practise. Jaws are expanded by a thread-



ed thimble, drawing the cone (an integral part of the arbor) against them. They have a corresponding taper, but are flat against the cone, not concave. To release jaws, the thimble is un-

(Continued on page 206)

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There is a **Bokum Boring Tool** available to meet *ANY* size requirement up to the capacity of the machine on which the tool will be used, from diameters of 3/32" to infinite diameters.

Send for folder A-1139 giving complete range of sizes and prices.

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Bokum Tools are made for three distinct purposes: (1) Style A, for general boring, (2) Style B, for facing and bottoming, and (3) Style C, for internal threading.

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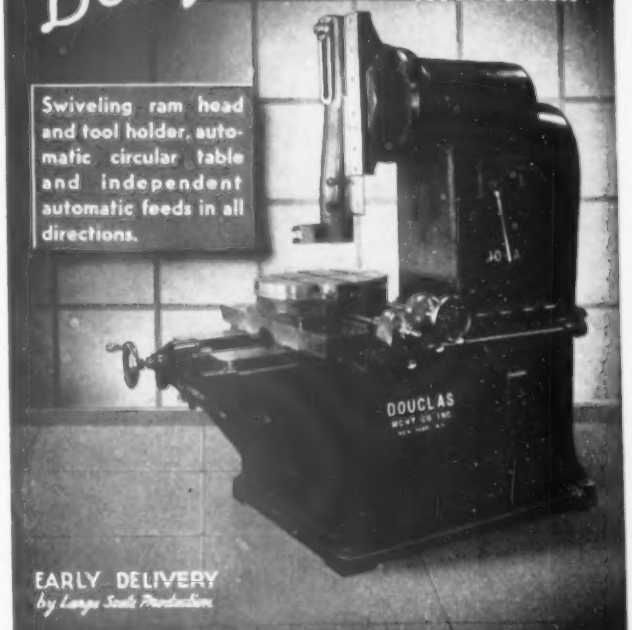
Douglas 10" STROKE SLOTTER *for Precision*



Swiveling ram head and tool holder, automatic circular table and independent automatic feeds in all directions.

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STURDY-BILT *"SIMPLEX"* Metal Parts CLEANER

This small, compact, automatic and mechanically simple unit combines the two most positive methods of cleaning Metal Parts, Assemblies, Shells, Cartridges, Castings, Stampings, etc. A swishing action positively removes all grease, oil, dirt and metal chips that have been loosened during the "chemical action" of the "soak". Can be installed in different departments or in a series — one unit for cleaning, another for rinsing or rust prevention coating and others for special requirements. Send for "Simplex" bulletin for complete details.

and for CONTINUOUS *Large Scale* PRODUCTION

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Combines long agitated "soak" with hydro washing action for large production. Parts are loaded onto trays, passed through the soaking tank — then are rinsed to remove oil film and clinging chips — then subjected to a power wash. They are removed dry and ready for use or for the next manufacturing operation. Simplicity is the keynote of construction as well as operation. Send for complete details.

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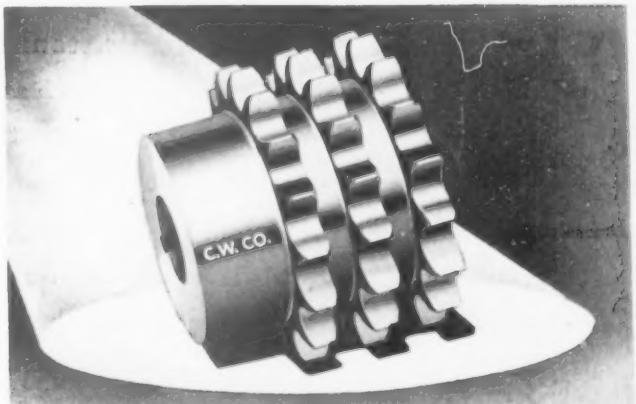

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Whether of machine tools, tanks, planes or ships, "Allens" preserve the UNITY of each assembly. They hold parts together *under fire!* They support the quality of *your* war goods by maintaining their own.

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Order only through your local Allen Distributor — the man who gets you the goods to the LIMIT of the supply!

ALLENS

THE CRIB

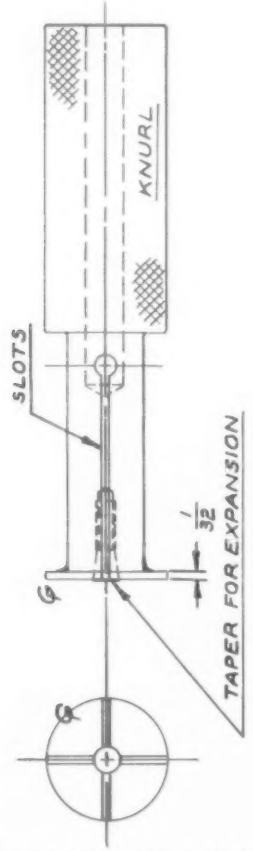
(Continued from page 204)

screwed and the cone is retracted by a heavy spring. Lighter springs, with plugs, retract the jaws. The latter are ground on the O. D. in assembly, or they may be checkered.

The operation may be reversed, with the spring doing the expanding and the thimble releasing. This of course entails a change of design. The tool is quick acting and self-centering.

Precision Hole Check Gage

TO CHECK DIAMETER of precision holes for size and bell mouth, this simple tool is handy and accurate. The material is tool steel, hardened and preferably ground, although case-hardened mild steel will serve. The gaging surface is 1/32-inch long and finished to within .005 under finished size.



A tapped hole with a slight taper lead permits adjustment, the slots providing expansion. While the actual design can be varied to suit the application, the tool illustrated can be a nucleus to a simple but effective gaging system.

(Continued on page 208)

THE

REID

2B

All Electric Automatic and Hand Feed Surface Grinder

A PROVEN PRODUCT FOR OVER A QUARTER OF A CENTURY

THE Reid All Electric Surface Grinder is equipped with a motorized spindle, thereby eliminating all belts, pulleys, and counterweights. Table and cross slide are equipped with oil rollers, insuring greater life and proper lubrication. Table is operated with a silent chain instead of rack and pinion gears. Grinding capacity 6 x 18 x 11. Additional height if required on all standard machines. Send to Dept. O. for descriptive literature.

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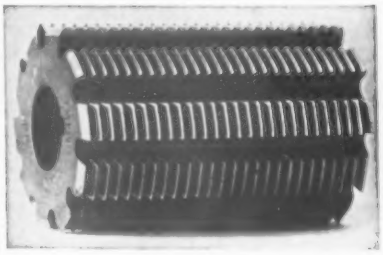
MULTIPLE THREAD MILLING HOBS



—in any thread system, any thread angle, any thread form. Inch or metric scale. Left or right hand threads. Free from distortion. Up to 7" O.D., and 4" thread length for internal or external threading.

TOLERANCES: CUT ON MACHINES ADJUSTABLE FOR TOLERANCES UP TO 1/10,000"

All hobs demagnetized relieving chips immediately

These hobs precision cut by methods used for more than 25 years, eliminating any discrepancy between thread form and form of finished work, thus speeding up production without sacrificing accuracy. Full details upon request to Dept. T.

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Maximum Tool Life *plus* Maximum Production —Use CROBALT!

● A superior heat resisting chromium-cobalt-tungsten high speed cutting alloy. Permits higher speeds with longer tool life.

Eliminates the possibility of chipping. Combines maximum production with minimum cost per piece.

Catalog rushed on request . . .

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CROBALT

Rawhide HAMMERS MALLETS

Carefully made, accurately balanced, with weighted heads where extra striking power is needed. Strike forceful blows without marring or battering, without recoil or bounce. Never split, chip, "smear" or crack, retain this true striking face so every blow goes right to the target . . . gets work done. Long wearing, mechanically cured, coiled Rawhide faces for outlast soft metals, plastics, wood or rubber.

Replaceable Heads

Replaceable Insert Faces are available for C.R. Hammers . . . make each a "lifetime" tool.

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Illustrated below are Involute Splined Arbors made to aviation tolerances.

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Straight Side, Serration, Involute Male and Female Splined Gages, Plug, Ring, Snap, Flush Pin, Profile, Fixture, Length, Width, Thickness and Relation Gages. We have a complete Spline Engineering Service for your convenience. Gages with close tolerances are normalized and stabilized. All gages are inspected at 68° Fahrenheit. May we quote on your requirements.

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Quality GRINDERS and BUFFERS

... means more ...

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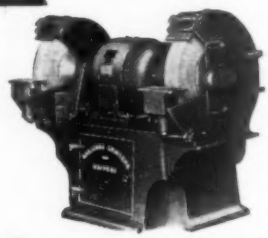
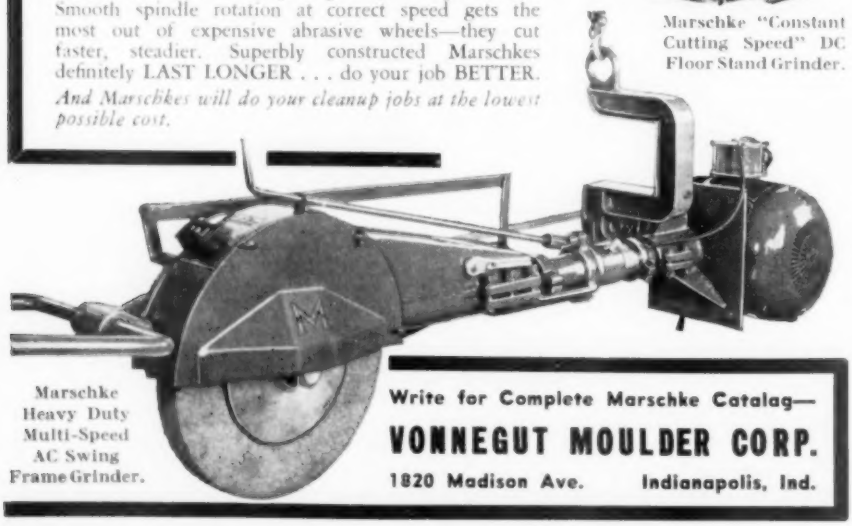
The *EXTRAS* built into efficient Marschkes mean GREATER OUTPUT . . . FEWER MAN-HOURS. Whether you need a floor stand or a swing frame grinder equipped with a 1 HP or a 25 HP motor there is a Marschke for your particular requirements. Smooth spindle rotation at correct speed gets the most out of expensive abrasive wheels—they cut faster, steadier. Superbly constructed Marschkes definitely LAST LONGER . . . do your job BETTER. *And Marschkes will do your cleanup jobs at the lowest possible cost.*



Marschke "Constant Cutting Speed" DC Floor Stand Grinder.



Marschke Heavy Duty Multi-Speed AC Swing Frame Grinder.

Write for Complete Marschke Catalog—

VONNEGUT MOULDER CORP.

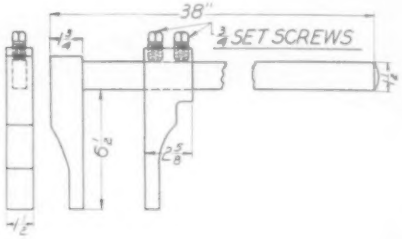
1820 Madison Ave. — Indianapolis, Ind.

THE CRIB

(Continued from page 206)

Useful Wrench Handles Solid Die Nuts

A WRENCH with adjustable jaws secured by two set screws has proved handy in the locomotive shop because of its light weight and size. It is capable of handling the largest nuts found on a locomotive. While not strong enough for the final tightening, or for use with a sledge hammer, it can be used for running up large crank pin nuts and wrist pin nuts that must fit snugly. The use of a sledge hammer on wrenches is prohibited in some shops and a wrench of suitable proportions to tighten a six inch crank pin nut is almost a two man wrench. The wrench shown may be used till ready for the final heave and then a heavy forged box wrench can be applied.



This tool is useful for turning the solid die nuts furnished for chasing threads on crank pins. These dies are seldom standard size across the flats and use of the adjustable wrench makes special wrenches unnecessary. The tool is strong enough for two men to use with a six-foot pipe on the handle.

To Pick Up Fine Gears

SOME PLANTS manufacturing or handling large quantities of small gears, such as can be picked up by wetting the finger, supply employes with small wads of bread dough. Gears are quickly picked up in handling merely by pressing the dough on them.

THE TOOL ENGINEER will pay $5.00 for your kinks or shop short-cuts published in this column. Brief, practical articles should be accompanied by sketches or photos.

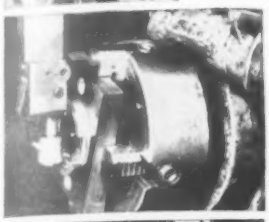
4 of the many ways SLOTMASTER can be used to save TOOLS & SETUPS

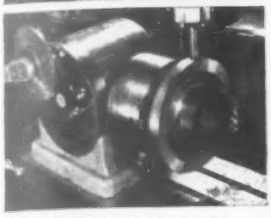
Left: Set-up for cutting a spline. Below: Set-up for cutting an internal gear.

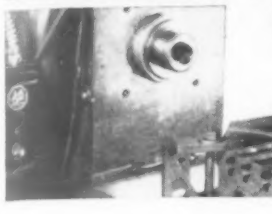
SLOTMASTER can be used on any round or flat-on-round overarm milling machine and will do precision work that normally requires a multi-thousand dollar machine. (All working parts are of tool steel heat treated and ground to close tolerances). It takes but little time to change over from one head to the other . . . the stroke of the ram is adjustable from 0 to 4" . . . the speeds range from 50 to 250 S.P.M. The tool holder is of the clapper box type and can be turned in any position. SLOTMASTER comes complete with pull-motor, mounting bracket, etc. . . . Send for a 4 page catalog—give specifications of the milling machines you wish to equip.

Immediate deliveries on high priorities.

EXPERIMENTAL TOOL & DIE CO.
12601 Greiner
Detroit, Mich.





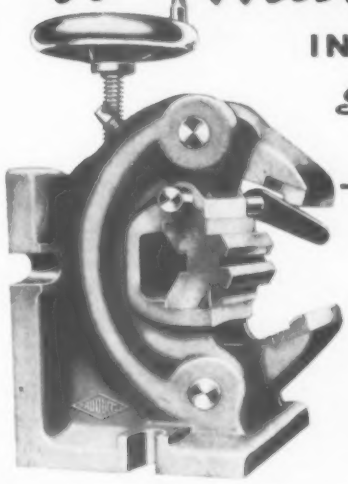


Below: Conventional set-up on a round overarm milling machine thumbnail shows the set-up for cutting a feed cam.

A Natural...

IN ANY SHOP

Self Centering Shaft Vise



This modern machine vise is a "natural" because it just naturally is an asset to any machine shop. For machining slots and keyways in shafts or spindles, ⅜" to 3⅛" diameter—suitable for horizontal or vertical mounting. Setting of vise remains unaltered for all work diameters—insures accurate radial cuts. Hardened V jaw reversible in vise—equal movement of two jaws locates shafts correctly in V jaw.

Base size 8" x 7¼". Approx. wt. 80 lbs.

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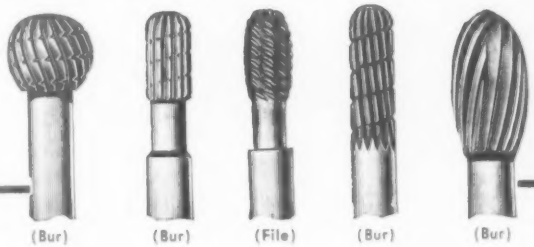

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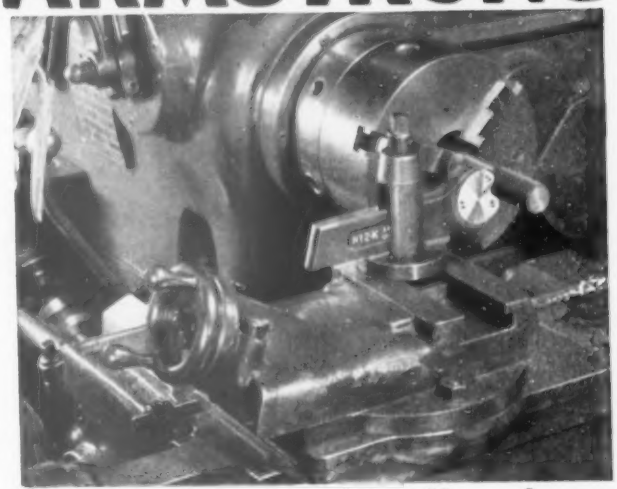

Uniform clean-cut knurling always

● Your knurling can be no better than your knurls and the tool that holds them. Standardize on ARMSTRONG Hobcut Knurls—the sharper deep cut, accurately formed patterns. Use them in the ARMSTRONG Knurling Tool which is automatically self-centering, which automatically equalizes pressure on knurls and "tracks" accurately. Knurls are held in a large knuckle joint that has strength to withstand tremendous side and end thrust. Write for Catalog C-39.

ARMSTRONG BROS. TOOL CO.
"The Tool Holder People"
360 N. Francisco Avenue Chicago, U. S. A.
Eastern Warehouse & Sales: 199 Lafayette St., New York

THE PASSING PARADE . . . .

T.M. REG. U.S. PAT. OFF.

The Ever-Changing Scene in Mass Manufacturing

• *INGLE R. SHUE* of the Gardner Machine Company, Beloit, Wisconsin has been appointed a member of the American Standards Association's Sectional Committee on the Safety Code for the Use, Care and Protection of Abrasive Wheels.

• *R. M. ELLIS* has joined the organization of the Aircraft Parts Development Corporation of Summit, New Jersey and will act in the capacity of Chief Mechanical Engineer.

• *B. C. HEACOCK*, chairman of the executive committee of the Caterpillar Tractor Company, was recently appointed director of the Priorities Control Division of the Distribution Bureau, W. P. B. Last year, Mr. Heacock served for eight months as special assistant on production to the Under Secretary of War.

• *DR. BLAINE B. WESCOTT*, chief of the materials and products chemistry division of The Gulf Research and Development Company of Pittsburgh, Pa., has been appointed a member of the Sectional Committee on Pipe Threads of the American Standards Association. The scope of the committee covers the American (Briggs) Standard taper and straight pipe threads, plumbers' threads, threads for electrical conduit and threads for thin tubes.

• *J. KENNETH SALISBURY* of the General Electric Company's Turbine Engineering Department, was awarded the A.S.M.E. Melville Medal for his paper, "The Steam-Turbine Regenerative Cycle — An Analytical Approach."

• *FELIX DORAN, JR.*, General Manager of the Fleet Division, General Motors Corporation, has been appointed assistant chief of the tank and vehicle section of the Supply Branch of the Tank-Automotive Center of the Ordnance Department, according to an announcement made recently by Brig. Gen. A. R. Glancy, Deputy Chief of Ordnance in charge of the center.

• *A. M. SWIGERT*, master mechanic of the Chrysler Corporation of Detroit, and *W. MIKELSON* of the General Electric Company, at Schenectady, N. Y., have been appointed members of the Sectional Committee on Classification and Designation of Surface Qualities of the American Standards Association. The scope of this committee is to classify and designate surfaces according to quality of surface.

• *G. V. BATE* has been appointed superintendent and *L. E. G. SUITER* has been appointed as supervisor of production at the Sunbury Works of the Westinghouse Electric and Manufacturing Company.

• *JOHN H. SIPCHEN* has been named first assistant to the president of Anker-Holth Manufacturing Company of Chicago. Mr. Sipchen will have charge of production and the de-

(Continued on page 212)

A GILMORE DIAMOND TOOL FOR EVERY SHOP REQUIREMENT

Whatever your needs may be: for a grinding wheel dresser, a hardness tester, a thread grinding tool, or a keen cutting tool for the purpose of boring or turning non-ferrous metals or plastics, we can make it for you.

The more popular types of diamond tools we can deliver to you immediately; others which must be made up according to your blueprint are produced and delivered on a satisfactory time schedule.

We are geared to the demands of war production. We number among our customers, some of those industrial concerns who hold the largest primary contracts. Let us demonstrate the durability and dependability of Gilmore Diamond Tools in your plant,—let us help you increase your own output through the use of Gilmore Diamond Tools which are exceptional in quality and distinctive in performance.

Write for information today.

F. F. GILMORE & CO.

Manufacturers of Diamond Tools

285 Columbus Ave. Boston, Mass.

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To make drilling or welding easier

Use KNU-VISE Pliers

To hold parts together for operations such as drilling, spot welding, or riveting, Knu-Vise Pliers have proved exceptionally efficient because there is no time wasted in fastening or releasing them. One flip of the lever applies the required pressure and another flip releases the work just as quickly. Holding of work is simplified and production is stepped up. Let us show you efficient methods of holding parts for speedy production.

Send for new catalog

KNU-VISE INCORPORATED
2204 Eighth St., Detroit, Mich.
4328 San Fernando Rd.
Glendale, Calif.

TUTHILL

THE COOLANT PUMP that laughs at chips and grit

There are good reasons why the Tuthill Model M Coolant Pump is outstanding in wartime production. Compactly built, this positive displacement internal-gear rotary pump is designed with an exclusive safety feature that assures long, dependable, uninterrupted service.

Model M has a built-in, automatic by-pass which permits small chips and similar particles to pass through the pump without serious injury to working parts, and compensates for wear.

Six sizes from 1 to 50 g.p.m. Available in stripped form for direct incorporation into the design of the machine, to save space and material.

Write for complete catalog describing these and other dependable pumps for production machinery and scores of wartime applications

Tuthill PUMP COMPANY
939 East 95th Street • Chicago, Illinois

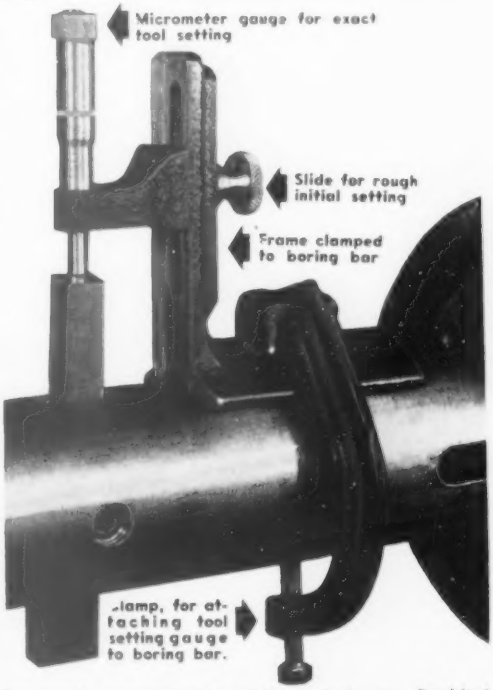
GAMMONS OF *Manchester*

PRODUCTION TOOLS

ORIGINATORS AND MANUFACTURERS OF HELICAL FLUTED TAPER PIN REAMERS

THE GAMMONS-HOAGLUND CO., MANCHESTER, CONN.

BARTELT *Tool Setting Gauge*

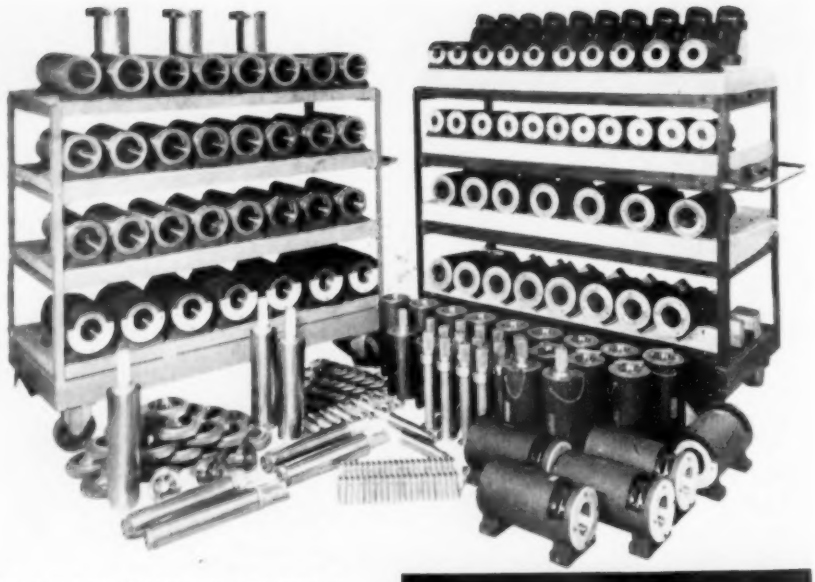

Micrometer gauge for exact tool setting
Slide for rough initial setting
Frame clamped to boring bar
Clamp, for attaching tool setting gauge to boring bar.

For speedy, accurate setting of boring tools, etc. Furnished with either a micrometer or dial indicator.

To use, gauge is clamped to boring bar, slide is dropped until "mike" rests on cutter. Micrometer is then backed up correct number of thousandths, cutter, re-set and work is ready to proceed.—It enables *inexperienced* men and women to set cutting tools in boring bar accurately and speedily.

Write for folder and prices.

BARTELT ENGINEERING COMPANY
1216 Partridge Ave., Beloit, Wisconsin



All sizes from 30 caliber to 4.7" brass or steel cartridge cases.

All required types including Max. Profile Chamber Gages & Checking Plugs.

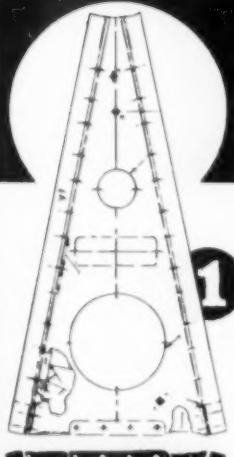
System Includes
NEW GAGES
GAGE INSPECTION SERVICE
GAGE RECONDITIONING SERVICE

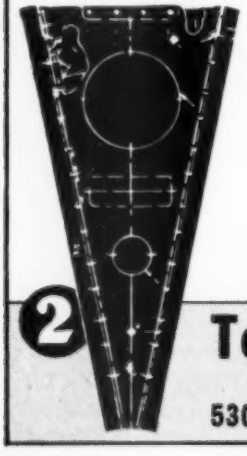
QUALITY TOOL-DIE CO

Reg. U.S. Pat. Office

Write for complete information
QUALITY TOOL & DIE CO.
Noble & Vermont Sts., Indianapolis, Ind.
Phones: Lincoln 1988 or Lincoln 1986

Complete Gaging Systems for CARTRIDGE CASE INSPECTION





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New Method, Volume Production Basis, Guaranteed Accuracy

Template duplications made by our contact duplicating method, on 18 gauge auto body steel. Drawing lines and details etched or indented on practically indestructible surface. Will stand hardest shop wear and abuse. We duplicate accurately from scribed master templates, photoprints, photodrafts or X-Ray prints. Tolerance plus or minus .005. Expertly band-sawed and filed. Aircraft prime and subcontractors now using our service.

STYLE 1.
Dark blue lines indented on light grey permanent surface. Will not chip. Lines and surface cannot be rubbed or worn off. Send for sample

STYLE 2.
Etched lines on dark blue permanent surface. This and Style 1 more durable than duplicates made by other methods. Sample on request.

Template & Parts Division
(A War Production Affiliate of Cleveland Shopping News)
5309 Hamilton Avenue Cleveland, Ohio

velopment of air and hydraulic operated chucks, fixtures and devices.

• *W. R. HUCKS, R. G. BOYD* and *R. J. HULL*, technical men connected with the B. F. Goodrich Company of Akron, Ohio, have been loaned to the United States Government and will assume posts in organizations administrating the nation's synthetic rubber program, it was recently announced.

CHARLES C. FICHTNER
Takes post at Strippit Corp.

• *CHARLES C. FICHTNER* has been appointed vice president and treasurer of The Strippit Corporation of North Tonawanda, New York, it was recently announced by George F. Wales, president.

• *MR. J. H. COOPER* has been appointed Chief of the Resistance Welding Section, General Industrial Equipment Division, War Production Board, in Washington. Mr. Cooper has been given an indefinite leave of absence by The Taylor-Winfield Corporation, with whom he has been associated for the last six years as Welding Engineer.

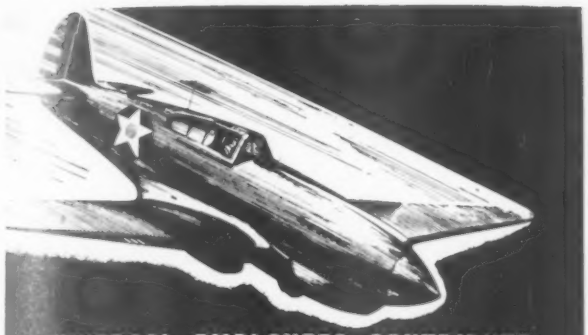
• *THOMAS J. MULVEY* was recently appointed as production manager of General Electric's River Works at Lynn, Massachusetts.

• *H. L. HARVILL* recently announced the organization of a firm bearing his name which will specialize in centrifugal, pressure, and die castings, and permanent moulds. The plant will be located in Vernon, California.

• *J. D. MINOR* was recently appointed as manager of engineering for the Westinghouse Small Motor Division at Lima, Ohio.

• *C. A. BABBITT* of Norton Company, Worcester, Massachusetts, has been appointed field engineer for the territory comprising New York City, New Jersey, and Philadelphia. Mr. Babbitt will make his headquarters

(Continued on page 214)



UNIVERSAL EMPLOYEES CONTRIBUTE $50,000.00 FOR U. S. FIGHTER PLANE

We are proud to announce that out of their own pockets, the employees of Universal have bought and paid for a $50,000.00 fighter plane for Uncle Sam. And this, mind you, they have done in addition to subscribing 20% of their pay for War Bonds.

We are proud, too, of the precision-built Collet Chucks we're turning out to help produce war goods faster. Universal Collet Chucks have ground threads, ample room for tool feed-out and grip as strong as solid steel itself. Write today for complete facts.

UNIVERSAL ENGINEERING CO.
FRANKENMUTH • MICHIGAN

DON'T BLAME THE TAP!
Blame the Holder!

If holes are inaccurately tapped, the fault frequently is not with the tap itself, but is the result of spindle misalignment. The same applies to reaming. Oversize or bell-mouthed holes are the inevitable result of spindles being out of alignment with the work.

Instead of condemning the tools, try a different type of tool holder—a Ziegler Floating Tool Holder that automatically compensates for spindle misalignment. You'll be amazed at how it will solve your difficulties.

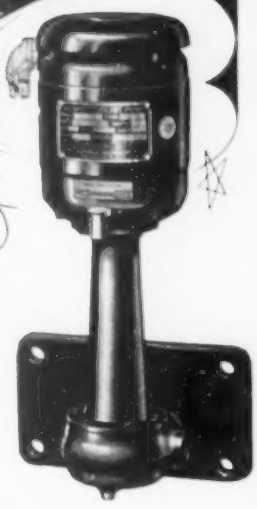
W. M. ZIEGLER TOOL CO.

1920 Twelfth St. Detroit, Mich.

Ziegler ROLLER DRIVE **FLOATING HOLDER** for Taps and Reamers...

Write for CATALOG

IT'S New MODEL 5-P3



The mounting flange of this new Gusher Pump is comparatively large, so as to be interchangeable with larger size Gusher Pumps. Therefore, easily adaptable to changing types of machine production. Right or left discharge. 1/10 h.p. Capacity: through ½" pipe at 5 ft. head is 10 g.p.m. Specifications and data on request. Write!

RUTHMAN GUSHER COOLANT PUMPS

The Gusher line of vertical motor driven Coolant Pumps give you exclusive advantages and patented features. For instance, Ruthman gives you the Twin Equalized Intake type with hydrostatic balance. This automatically cleans out intake chambers when discharge line is throttled. No building up pressure. Other **exclusive** features speed production. Gusher Pumps are recognized leaders. Write!

THE RUTHMAN MACHINERY CO.
1813 READING ROAD CINCINNATI, OHIO
LARGEST EXCLUSIVE BUILDERS OF COOLANT PUMPS

In War, as in Peace . . .

CERRO ALLOYS
SAVE TIME and CUT COSTS!

CERROMATRIX (Melting Temp. 250° F.) For securing punch and die parts, anchoring machine parts without expensive drive fits, short run forming dies and other metal-working applications.

CERROBEND (Melting Temp. 158° F.) Used as a filler in bending thin-walled tubing to small radii. Easily removed in boiling water. Also used for aircraft assembly jigs, templates for forming dies and other purposes.

CERROSAFE (Melting Temp. 190° F.) Used to accurately proof-cast cavities such as molds, gun chambers, forging dies, etc. and for many similar applications.

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HOUSTON, TEX., Metal Goods Corporation.
KANSAS CITY, MO., Metal Goods Corporation.
LONDON, ENG., Mining & Chemical Products, Ltd.
LOS ANGELES, CAL., Castaloy Corporation.
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CERRO DE PASCO COPPER CORPORATION
40 WALL STREET - - NEW YORK, N. Y.

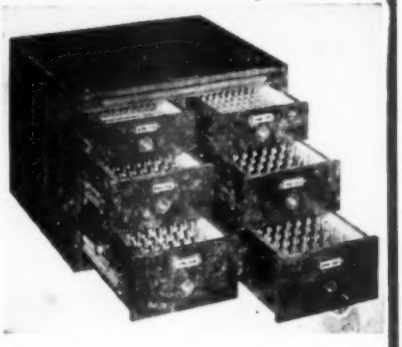
PRECISION

is the beainnina of Production Speed!

DUBLIFE

REVERSIBLE

PLUG GAGES



For double-life accuracy! When one end of either "Go" or "No Go" plug indicates wear from long use, reverse to other end. A NEW plug in service—securely locked in hexagon handle by tapered bronze collet. Time-saving! Low gaging cost. Double gage dependability!

Catalog describes full line

Sizes: .030 to 1". Other gages of American Gage design to 4½" also shown.(Larger sizes available) Write

Originators and Exclusive manufacturers of DUBLIFE GAGES and UPPCO FINISH.

UNITED PRECISION PRODUCTS CO.

3517 West Belmont Ave. Chicago, Ill.

"Ceiling on Grades- Not Quality"

"THE BIG 3"

HIGH SPEED STEELS

★ **BONDED CARBIDE** (18-4-1½-10 TYPE)

SUPER COBALT HIGH SPEED STEEL

★ **VINCO** (18-4-1 TYPE)

STANDARD TUNGSTEN HIGH SPEED STEEL

★ **BRAEMOW** (6-6 TYPE)

TUNGSTEN MOLYBDENUM HIGH SPEED STEEL

•

WRITE FOR LITERATURE

BRAEBURN ALLOY STEEL CORP.

BRAEBURN, PENNSYLVANIA

in the Philadelphia office.

• *W. P. HOPKINS* has been appointed puchasing agent of the Tuthill Pump Company of Chicago.

• *WILLIAM B. STOUT*, Detroit automotive and aeronautical designer and engineer, was recently engaged to work for the Consolidated Aircraft Corporation of San Diego, Calif.

The Stout Engineering Laboratories and Stout Skycraft Corporation, both organization's of Stout's have been incorporated into Consolidated's organization it was recently announced by Tom Girdler, chairman of the board of Consolidated.

• *A. H. B. JEFFORDS* was recently named a vice president of Trundle Engineering Company. With this concern since 1942, Jeffords will take over various administrative duties in the Cleveland office, specializing on war production rules, regulations and requirements.

• *JOHN A. ROSS* was recently appointed manager of Crucible Steel Company of America's Alloy Sales Department and will be located in New York.

DIED

• *HARTE COOKE*, senior engineer of the Diesel Division of the American Locomotive Company, died December 14th.

71 years old at the time of his death, Mr. Cooke served as instructor of Navy men stationed at Cornell University, Ithaca, N. Y., until a recent illness and was a member of the National Defense Research Committee.

Mr. Cooke was affiliated with the American Locomotive Co. for over half a century. During World War I he was a member of the United States Shipping Board.

• *LESTER G. BLACK*, president of the Black Drill Company and the Black Boring & Machine Company, Cleveland, Ohio, died on December 11th.

Born in Pittsburgh 43 years ago, Mr. Black began his career in Detroit where he worked with the Snyder Tool Company.

In 1936 he founded the Black Boring & Machine Co. in Cleveland. In 1939 he invented the hardsteel drill and in 1940 established the drill company bearing his name.

Mr. Black was a member of the American Society of Tool Engineers

(Continued on page 216)

What's a good
HOTEL IN DETROIT?

We're glad you asked . . . . because there's more than *one* good hotel in in this city. We could name six or eight outstanding hotels offering fine accommodations at comparable rates.

Well then, what hotel should you stop at in Detroit? We say you'll like *any* of our leading hotels . . . . but we ask that you give us a try.

We think we have a little extra to offer. It's difficult to describe this "little extra" but perhaps our long standing slogan can say it for us—

Aglow with Friendliness
HOTEL FORT SHELBY
DETROIT
J. E. Frawley, *General Manager*

Hammond OF KALAMAZOO **New!**
Multi V-belt Drive
CARBIDE TOOL GRINDERS
ANY ELECTRICAL SPECIFICATION AVAILABLE
COMBINATION CHIPBREAKER and CUPWHEEL GRINDER
DOUBLE V-BELT DRIVE

Model **4B** (ILLUSTRATED)
Keep 'em sharp with a Hammond 4B. Precision built, with maximum speed and vibrationless, smooth operation, this new V-belt driven machine gives you complete carbide tool maintenance.
SEND FOR BULLETIN 202
Hammond OF KALAMAZOO — CARBIDE TOOL and SNAGGING GRINDERS · ABRASIVE BELT SURFACERS · AUTOMATIC and DO CYLINDRICAL FINISHING MACHINES · POLISHING LATHES

Hammond Machinery Builders INC.
★ ★ ★ 1636 DOUGLAS AVENUE ★ ★ ★
KALAMAZOO • MICHIGAN
EASTERN BRANCH 71 W. 23rd STREET, NEW YORK CITY

Characteristic of the design of all STURDIMATIC LIVE CENTERS is a low overhang and a slight cushioning action . . .
that compensates for expansion due to heat, shock and excessive thrust loads—reducing wear to a minimum. A properly engineered live center is one of the fundamentals of setting up a job and requires a specialist's experience . . . standard shanks with Morse taper carried in stock.

We will see that your job is set up with the right LIVE CENTER—prompt deliveries on high priorities

STURDIMATIC TOOL COMPANY
5218 THIRD AVE. DETROIT, MICH.

Infinite Positions
WITH NEW SELF-ADJUSTING PEC JIG CLAMPS

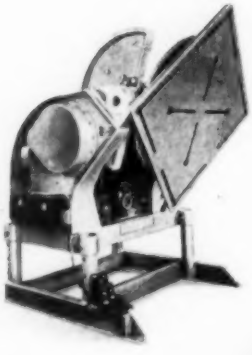
No other clamp is as flexible in its applications . . . in closed position, the clamping bar has infinite adjustment up to 15° below and above horizontal . . . yet you can't shake open the new PEC drop forged jig clamp. Because of the exclusive PEC self-adjusting feature (which operates like the slotted aperture on a pair of pliers) it is now possible to carry a much smaller stock, as one PEC is adjustable to do the work of many ordinary non-adjustable jig clamps.

Write today, outlining your requirements, and complete information on this new PEC jig clamp will be rushed to you.

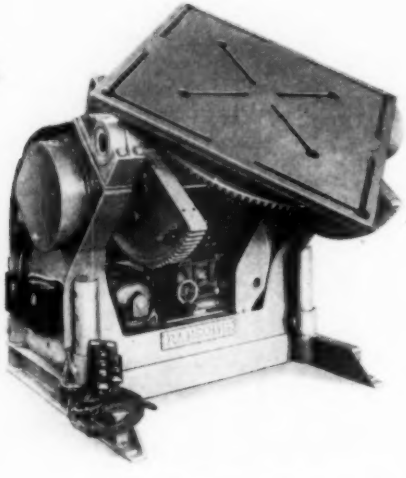
SELF-ADJUSTING . . . QUICK-ACTING . . . INFINITE POSITIONS . . . DROP FORGED . . . POSITIVE LOCK

PEC
Products Engineering Co.
LOS ANGELES CALIFORNIA

For Position-Welding Long Pieces . . .



Ransome POSITIONERS provide a means for elevating



Just one more convenient feature of this modern equipment . . . to assure a DOWNHAND position for all welds, including long or complicated pieces.

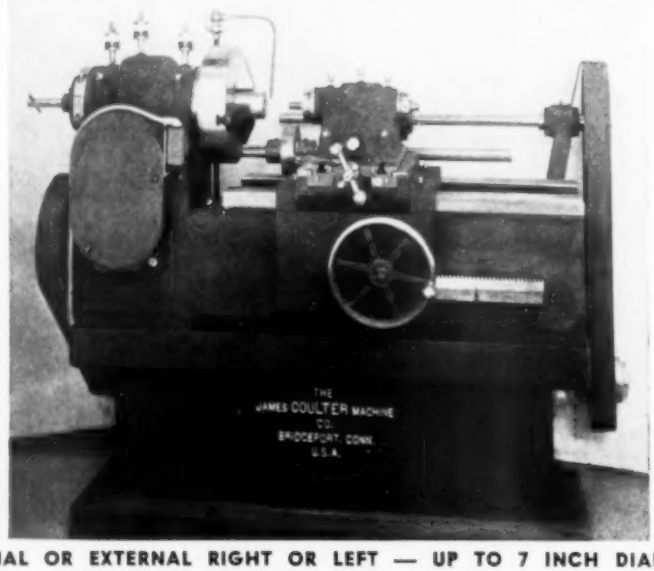
Write for literature, and for specific recommendations on solving your present welding problems.

Ransome WELDING POSITIONERS

INDUSTRIAL DIVISION • RANSOME MACHINERY COMPANY • DUNELLEN, NEW JERSEY

PRECISION THREAD MILLER

FULL AUTOMATIC CONTROL



INTERNAL OR EXTERNAL RIGHT OR LEFT — UP TO 7 INCH DIAMETERS
COMPLETE MOTOR EQUIPMENT — FIXTURE TO SUIT

The James COULTER Machine Co.

BRIDGEPORT • CONNECTICUT • U. S. A.

and of the Tool and Die Progress Institute.

• *THOMAS J. SANTRY*, vice president of the Peerless Machine Company, Racine, Wis., died November 24th. Mr. Santry was 48 years old.

THOMAS J. SANTRY
With Peerless Co. 24 years

Affiliated with the Peerless Company for the past 24 years, Mr. Santry served with this concern as purchasing agent and assistant secretary prior to becoming vice president.

Mr. Santry was active in all the affairs of the Racine Chapter of the American Society of Tool Engineers. He was a charter member and played an important part in the organization of the Chapter in Racine.

HUGH PURDY and CLAYTON R. BURT

HUGH PURDY, a member of the English firm of Buck & Hickman, Ltd., died in England on December 3. Sixty-six years old, Mr. Purdy finished his apprenticeship period at Pratt & Whitney in 1898. In Europe since 1900, he was a member of a concern that is an agent for Pratt & Whitney.

• *ADOLPH L. DE LEEUW*, vice president of The Goss and De Leeuw Machine Co., New Britain, Conn., died at his home in Plainfield, N. J.

(Continued on page 218)

Get Facts Now On

DRILL JIG BUSHINGS

and Other Precision Items!

* A simple stroke of the pen . . . your signature affixed to a set of specifications will bring quick information on Acme's two complete bushing standards . . . the A.S.A. (American Standards Ass'n.), and the Acme Standard. Because of this larger line of bushings, special requirements are often found to be standard at Acme.

In addition to the manufacture of drill jig bushings, Acme also offers many other precision items such as, Dowel Pins, Liner Pins and Bushings, Screw Machine Reamers, Limit Gages and Lightwave Measuring Equipment. Other Acme services include Precision Grinding, Flat and Cylindrical Lapping and the manufacture of hardened and ground parts to order.

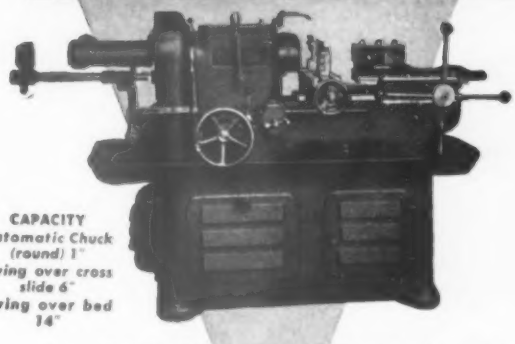
Write—Your inquiry will receive prompt attention.

ACME INDUSTRIAL CO.

Makers of Standardized Jig and Fixture Bushings
Telephone: MONroe 4122
208 N. Laflin St. Chicago, Ill.

for ECONOMY—for HIGH SPEED PRODUCTION

The MOREY 2G
Back-Geared
TURRET LATHE
Timken Bearing
Self-Locking Turret and Infinite Spindle Speeds



CAPACITY
Automatic Chuck (round) 1"
Swing over cross slide 6"
Swing over bed 14"

Thousands of the MOREY 2G Turret Lathes are saving money with no sacrifice of high speed production. Economy features: Back Gears are instantly thrown in through extra large Twin Disc Clutch—Full advantage from high speed and carbide tools—Vibrationless precision and an infinite variety of spindle speeds for every job—Timken bearing—Self-locking turret. Can be furnished with tooling.

Ask for Circular 629 for full details

MOREY MACHINERY CO., INC
410 BROOME STREET • NEW YORK, N. Y.

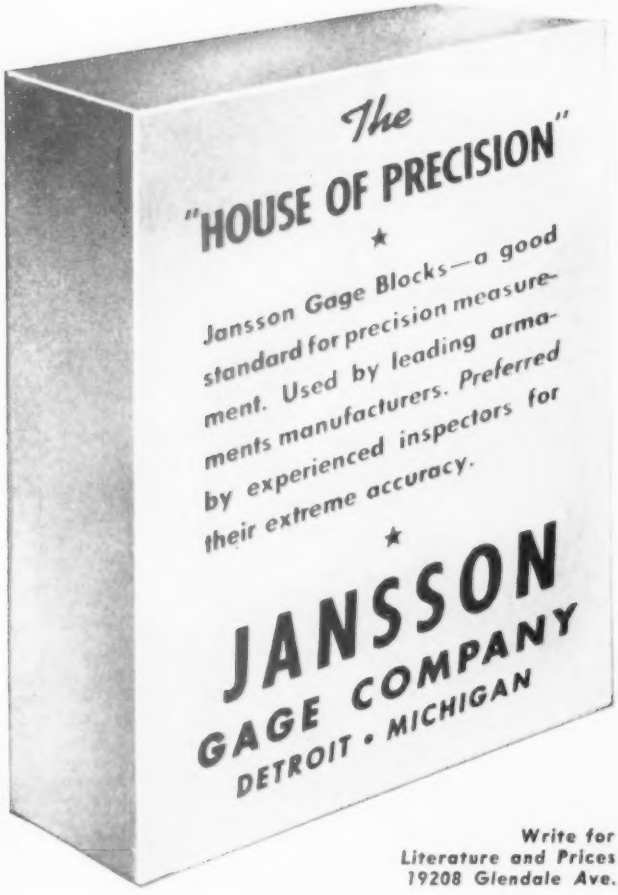
Thanks a million..... you've saved us an indefinite tie-up

EXCERPT FROM CUSTOMER'S LETTER

Words like the above have meant much to us at Threadwell. Months ago we knew that it was not enough to have all our wheels turning. We knew it was not enough to sort and pile and route the orders according to priority ratings. That was expected of us. But we felt that we could do more than that. We felt that we could and should break bottlenecks by giving PERSONAL ATTENTION to each order. We have done so. And it has produced results. It has (in some cases) put taps onto the job the next day instead of months later. In all this we have worked hand in hand with a great expediting force . . . our Threadwell distributors. We share with them the satisfaction of doing more than was expected of us.

SALES AGENTS

Threadwell
"TAPS OF DISTINCTION"
are made by the Threadwell Tap and Die Company, Greenfield, Massachusetts, U.S.A., founded in 1902.


The
"HOUSE OF PRECISION"
★
Jansson Gage Blocks—a good standard for precision measurement. Used by leading armaments manufacturers. Preferred by experienced inspectors for their extreme accuracy.
★
JANSSON
GAGE COMPANY
DETROIT • MICHIGAN

Write for Literature and Prices
19208 Glendale Ave.

Available for Immediate Delivery

A.G.D. STANDARD ADJUSTABLE LIMIT SNAP GAGES

Attractively Priced

WRITE FOR ILLUSTRATED PRICE LIST

COMPLETE RANGE OF MODELS AND SIZES

SATISFACTION GUARANTEED

QUALITY TOOL-DIE CO. Reg. U.S. Pat. Office

QUALITY TOOL & DIE CO.

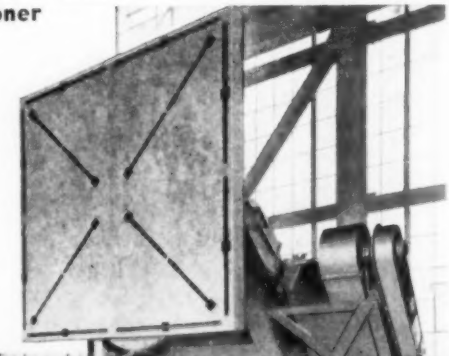
Noble & Vermont Sts. Indianapolis, Ind.

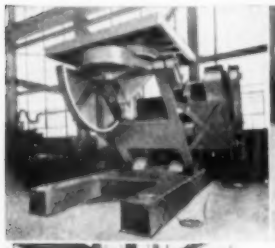
Phones: Lincoln 1988 or Lincoln 1966

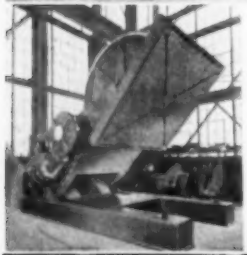
NEW 30,000 lb. C-F Positioner "Boom-type" Base

Now a giant C-F Positioner which has not only the capacity needed for shipyards and heavy machinery and equipment builders, but a new boom-type base that permits adjustment of table heights from 6'0" to 16'6" so that maximum floor and working clearance is assured for even extremely large and awkward shaped work.

Mounted on this boom-type base the Variable Speed Rotational Table not only rotates weldment completely around (360°) at any rotational speed, but can be tilted almost completely over thru an arc of 135° or to 45° beyond vertical—permitting down-hand welding not only of all sides and top of the weldment but of the "bottoms" too, with a single set-up.







Note Extra floor and working clearance obtained by tilting "boom", also how table can be tilted to degrees impossible with vertical or upright table support.

Capacity 30,000 lbs., 24" away from table, 18" off center. Portable Base (illustrated) or Column-in-floor Base. Push Button Control.

Write for Bulletin

CULLEN-FRIESTEDT CO.,

1318 S. KILBOURN AVE. CHICAGO, ILLINOIS

December 5th.

81 years old, Mr. De Leeuw was known as a consulting engineer, inventor and author.

• *JOHN J. HEBOR*, small tool and gage manager of the Cleveland Office

JOHN J. HEBOR
Died in Cleveland December 2

of Pratt & Whitney, died on December 2nd.

At the time of his death, Mr. Hebor was 50 years old. He started work in Hartford, Conn. in 1909, where he worked in the various departments of the small tool division until 1915. Since then, he had been with the

(Continued on page 220)

HIGH SPEED TAPS

NOW ON CRITICAL LIST. KEEP THOSE NOW IN SERVICE 100% EFFICIENT BY PROPER SHARPENING.

THIS NO. 12 GRAND RAPIDS TAP GRINDER MAKES THE JOB A SIMPLE ONE.

Bulletin on request

GALLMEYER & LIVINGSTON CO.
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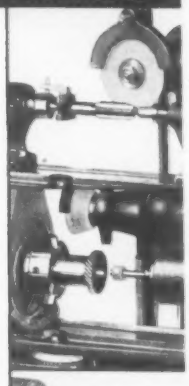
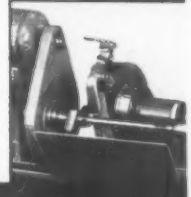
GRAND RAPIDS MICHIGAN

ROTOREX UNIVERSAL GRINDER

Designed specially for *The Modern Tool Room*





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For precision metal cutting tools made to your prints A. C. E. offers you a highly specialized experience that assures exact reproduction of your design and a rigid inspection which reduces rejects to a minimum. *NOTE: We make no cutting tools for stock.*

We have a special department for grinding reamers from the solid. In efficiency and life, reamers ground from the solid are far superior to the conventional type of milled reamers. A fair comparison would be that of a cut thread tap to a ground thread tap.

Write for new illustrated bulletin

AMERICAN CUTTER AND ENGINEERING CORP
31751 Mound Road, Warren, Michigan

AMERICAN CUTTER
AND ENGINEERING CORP., WARREN, MICH.
SPECIALIZING IN HIGH SPEED CUTTING TOOLS TO YOUR PRINTS

Federal Taperlock *Plastic* GAGE HANDLES

Immediate Delivery!

★ Made of durable plastic material, they are lighter than any metals used for Gage Handles.

★ This light weight makes gages more sensitive to touch and reduces fatigue caused by long continuous use—particularly in the case of women inspectors. Insulates from bodily heat, helping maintain accuracy of gages.

★ Made to fit gages of standard sizes. Easily marked for identification with the same lettering used for metal handles.

★ The low cost represents a real saving. **Available in 6 standard sizes, in any quantity and without delay.**

★ COLORS!!! A new feature in Federal Gage Handles. Permits quick identification of types or sizes without measuring gages. Available in BLACK—RED—YELLOW—GREEN.

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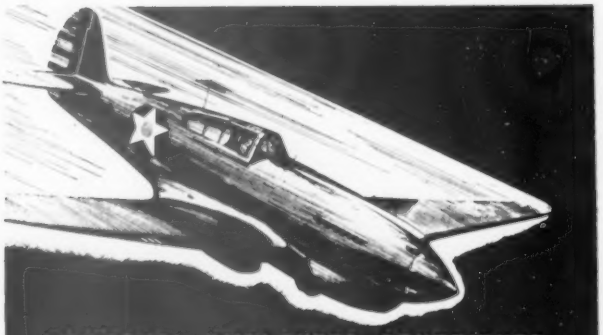
402 North Leavitt Street, Chicago, Illinois



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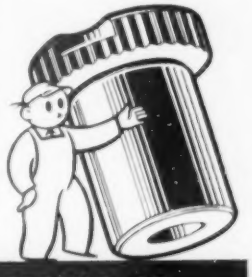
We are proud to announce that out of their own pockets, the employees of Universal have bought and paid for a $50,000.00 fighter plane for Uncle Sam. And this, mind you, they have done in addition to subscribing 20% of their pay for War Bonds.

We are proud too, of our precision-built Universal Drill Bushings that are straight and round and have superfinished bores for accuracy and long life. Write today for complete facts.



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GOVRO - NELSON DRILL UNITS, WITH THE *PROVEN-PATENTED CONTROLLED FEED BY CENTRIFUGAL FORCE.*

PRODUCTION MACHINES FOR A WIDE VARIETY OF APPLICATIONS.

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5901 Fourth Ave. Detroit, Mich.

PASSING PARADE

Cleveland office of that concern.

• *DAVID S. YOUNGHOLM*, Vice president of the Westinghouse Electric & Manufacturing Company in charge of the Company's Lamp Division, Bloomfield, N. J., died recently. Mr. Youngholm was 53 years old and had been with Westinghouse more than 33 years.

• *C. A. NICKLE*, consulting engineer at the General Electric Company, died December 8th at Schenectady, N. Y. With the General Electric organization since 1920, Mr. Nickle was one of the few men in the world to produce artificial diamonds.

THE END.

For the Latest News in New Equipment for Mass Manufacturing, Please Turn to Page 162.

EVEREDE BORING BAR HOLDERS

The Everede Boring Bar Holders are adjustable to fit various size lathes. (Bushings are furnished with each boring bar for use in the Holders.) Everede Holders keep the boring bar in a horizontal position, regardless of any change in the size of the lathe, within limits.

The No. 1 Boring Bar Holder is used on precision bench lathes from 7" swing to and including 9".

The No. 2 Holder is used on engine lathes from 8" swing to and including 12", and the No. 3 Holder on engine lathes from 12" swing to and including 24".

The Holders are made of case-hardened alloy steel. A tool post block is attached to the engine lathe Holders by a chain as shown.

Send for descriptive folder.

EVEREDE TOOL CO.

Willis Stutson

184 N. WACKER DRIVE, CHICAGO

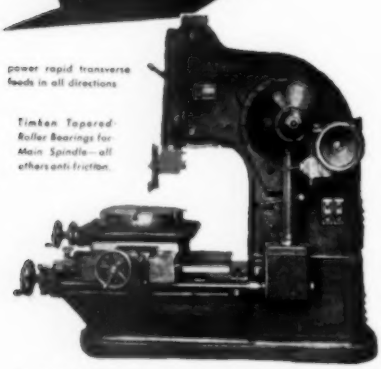
Representatives in principal cities

Accurate, High-Speed

MOREY VERTICAL SHAPERS

SELF-CONTAINED MOTOR DRIVE

8" STROKE
12" STROKE


power rapid transverse feeds in all directions
Timken Tapered Roller Bearings for Main Spindle—all others anti-friction.

Built to highest accuracy standards the MOREY VERTICAL SHAPER is simple for tool-room manufacturing. Power feeds and power rapid transverse feeds in all directions are instantly available in all operating positions.

Ask for Circular 726

MOREY MACHINERY CO., INC.

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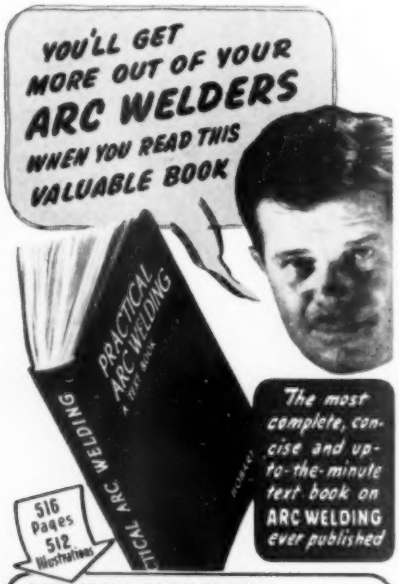
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PRACTICAL ARC WELDING
The most complete, concise and up-to-the-minute text book on ARC WELDING ever published
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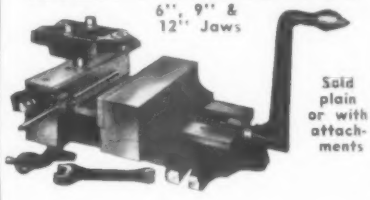
6", 9" & 12" Jaws



Sold plain or with attachments

With jig attachments and various special jaws we furnish, these vises will hold an amazing variety of work, eliminating the need for custom-made jigs and fixtures. For drill press, miller, radial, shaper, planer, grinder.

KNURL HOLDER FITTING LATHE TURRET

This versatile tool makes endless variations of patterns, straight, spiral and checkered from the same pair of straight cut knurls. Capacity: up to 2¼" dia. of work.

Request Illustrated Price Circulars

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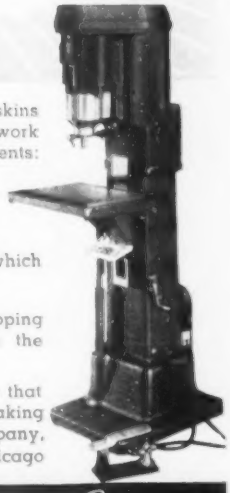
FOR HARDNESS TESTERS

THEY HAVE EVERYTHING—
PRECISION · SPEED · ADAPTABILITY

WILSON

CONCORD AVE NEW YORK MECHANICAL INSTRUMENT CO. INC.

AMERICA'S
MOST ADVANCED
TAPPING MACHINE



There's no tolerance problem on Haskins equipment. Absolute uniformity of work results from three Haskins developments:

Air Control which makes precision fit a constant factor, independent of operator efficiency.

Efficiently Engineered Fixtures which greatly simplify the handling of parts.

Piece-Part Control which makes tapping automatic except for placing parts in the fixture.

Send for TAPPING TIPS—new literature that gives many money-saving, money-making ideas. R. G. Haskins Company, 2756 W. Flournoy St., Chicago

HASKINS

HASKINS *Precision* TAPPING EQUIPMENT

"It Gives Us Better Tapping in Less Time"

Ask any production man in a shop where Procunier Tapping Machines have been given the acid test for years. Invariably you will get a story of increased output, more accurate tapping and greatly increased tap life. You will be told that the Procunier Tapping Head stands up year after year under the tough grind of production work—and quickly pays for itself in greater production. That's why Procunier Tapping Machines are being used by the most exacting production shops of this country.

Definite Reasons for This Superior Performance

The features that make better tapping possible include: 1. Four speeds, ranging from 390 to 2050 RPM, efficiently handle jobs for which conventional high speed tapping machines are inadequate. 2. One machine handles tap sizes from No. 2 to ½" through two interchangeable heads. 3. Extra long Spiral Compensating Springs conveniently located, with wide range hand screw adjustments, maintain pre-set tap feeding and reversing pressure INDEPENDENT OF OPERATOR.

SEND FOR BULLETIN giving full details, description and prices on the full line of Procunier Universal Tapping Machines.

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PROCUNIER SAFETY CHUCK COMPANY
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Send me bulletins on: ☐ High Speed Tapping Heads ☐ Tru-Grip Tap Holders ☐ Universal Tapping Machines.

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for accurately sharpening

CARBIDE TOOLS

BALDOR CARBIDE TOOL GRINDER is precision-built for accurately and quickly sharpening Carbide Tools. Sturdy ½ H. P. heavy duty, ball-bearing, reversible Motor. Large adjustable tool-rest tables. Satisfaction guaranteed.

NEW LOW PRICE **$95.00**

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BALDOR ELECTRIC COMPANY
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BUILT BY MOTOR SPECIALISTS

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BENCH PUNCH

Built for hard tough work — die cannot lose alignment with punch — all parts interchangeable.

Capacity ½" holes through 3/16" steel; 13/32" through ¼" steel. Can also be made for holes up to ⅞" in thinner metal. Stock punches and dies available from 1/16" to ½" by 64ths.

Weight, 70 lbs.

PRICE WITH ONE PUNCH AND ONE DIE—
$50.00
Immediate Shipment

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JANUARY MEETINGS

BINGHAMTON — January 6. 7:30 P. M. Arlington Hotel. Speaker will be Mr. H. E. Linsley of The Wright Aeronautical Corporation. A sound film "Power by Wright" and a film on special machine tool equipment will be shown.

DETROIT — January 14. 6:30 P. M. Detroit Leland Hotel. 8 o'clock technical session will feature Mr. M. J. Kane, Assistant Director of the Washington Headquarters of the Training Within Industry Branch of the WMC. Subject will be the Training Within Industry Program as an aid to better instruction of workers by training the supervisory staff.

ELMIRA — January 4. Speaker will be Mr. Walter R. Breeler, Assistant General Manager of Allegheny Ludlum Steel Corporation.

FOND du LAC—January 8. Technical session will feature a talk on "Industrial Diamonds" and a film on "Hardening Machine Parts."

HARTFORD — January 4. Hartford City Club. Speaker will be G. M. Sieger, president of S. M. S. Corporation, Detroit. His subject will be "Welding — Its Present and Future Status."

ROCHESTER — January 11. 6 P. M. Chamber of Commerce. Speaker will be Vernon A. Cook of the Metaling Company of America. Reservations: C. G. Newton — Tel. Stone 2893.

ROCKFORD — January 7. Dinner meeting at 7:15. Reservations: Allis Chalmers, 510 Gas-Electric Building, Tel. Main 6270.

SCHENECTADY — January 14. Talk will be on contour lathes by a member of the Monarch Keller Corporation.

SPRINGFIELD, VT. — January 14. 7:30 P. M. Masonic Temple. Speaker will be Mr. John E. Rockstrom,

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•TOOL DESIGN

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10 & 14 x 36" Norton Plain, M.D.
2" x 8" Van Norman Piston
Lapper, 26" Bethel-Player

LATHES
Putnam, 60" x 17' with 12" Riser Blocks
Sundstrand Stub, 8" M.D.
J & L 3" x 36" Dble Spindle

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Cooler dressing. Closer tolerance. Micrometer Accuracy.
Because: Wing key heat dissipation and absolute diamond lock nib.

● Three grades of diamonds. Common quality $12 per karat. Medium quality $24 per karat. Select quality $48 per karat. (Contour template diamonds supplied only in Medium and Select quality.)

All diamond sizes ¼ to 10 karat are nib mounted for immediate shipment . . . Billed subject to approval. Specify quality of diamond wanted. We recommend a minimum size of one karat for each 6" diameter of grinding wheel. (24 hour resetting service, $1.00 post paid.)

Grinders instruction card free.

Send specifications and prints for prices on turning and boring *form tools.*

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SOCKET-HEAD CAP SCREWS
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All Die Makers' Supplies
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DANLY
PRECISION DIE SETS

MEETINGS

Patent Engineer of the Cone Automatic Machine Company, Inc. He will talk on "Patent Procedure." A film entitled "This Plastic Age" will be shown.

WINDSOR — January 11. Prince Edward Hotel Ballroom. H. Murch of the Jones & Lamson Machine Co. will be the speaker of the evening. The subject of his talk will be "Inspection by Projection."

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SALES ENGINEER—for established New York City Engineering and Design firm. Preferably engineer or tool designer with shop and sales experience and trade contacts. Drawing account against commissions. Box 756, The TOOL ENGINEER.

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Machine Tool Builder with well-known, medium size organization, designing and building special and standard machinery, firmly established for many years, location Detroit. Excellent opportunity for a permanent position.

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Do you lack coordination of technical skill and sales ability in the Middle West, Detroit and surrounding territory? Am 46 years old thoroughly conversant in High Speed Steel and Carbide Tipped Cutting Tools, Precision Gaging Tools, Machine Tools, Metal Working Tools, kindred and related lines. And would be interested in hearing from principals with the possibility of changing my present arrangements to handle your items exclusively. My contacts are with production executive buyers and I am geared to start producing immediately. Box 754, The TOOL ENGINEER.

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are used on—

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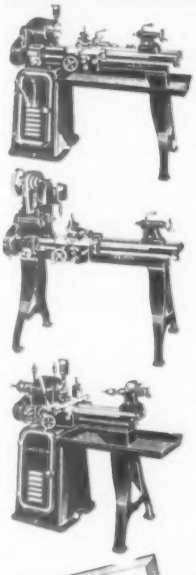

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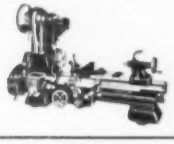
Production Lathes with lever operated collets, lever cross slides and tailstocks. Ideal for second operation work — sturdily built precision tools.

Machine Shop and maintenance department lathes, with a wide choice of attachments, accessories and drives.

Better Bench Lathes with Bronze, Ultra-Precision Pre-loaded Ball or Super-Precision Roller Bearings.



Just out "The Care and Operation of a Lathe" to help apprentice training. 50c list price, discounts for quantity purchases.

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All-out-for-Victory production schedules have imposed incredible demands upon the tool industry. Tool problems and tool inventories have multiplied tremendously. Well-equipped plants must maintain a constant supply of efficient and sharp tools for peak production at a minimum cost.

If increased production and lower tool costs are of vital importance in your shop, investigate your scrap pile for tools that can be reconditioned to equal the performance of new tools. Many factories are thus reducing tool inventory, stepping up efficiency, increasing production and profits.

Consult us about our tool reconditioning service— a trial will convince you. Our experience in solving tool problems covers more than 30 years.

A COMPLETE RECONDITIONING SERVICE FOR TOOLS

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Chrome Plant · MASTER CHROME SERVICE, INC., 5709 HERMAN AVE., N. W., CLEVELAND, OHIO

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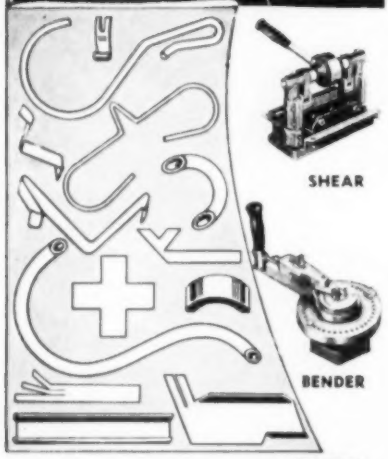

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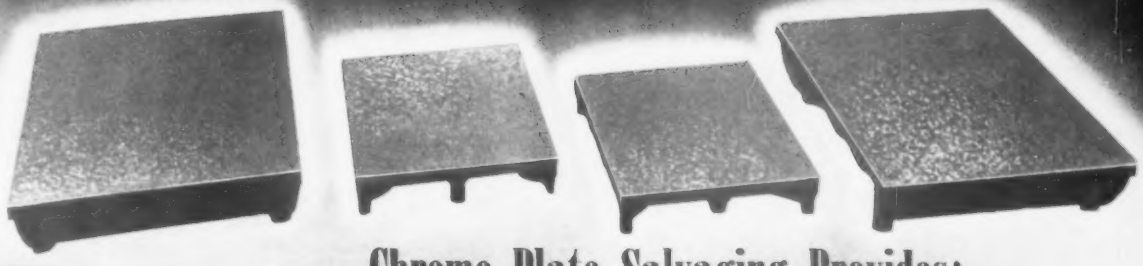

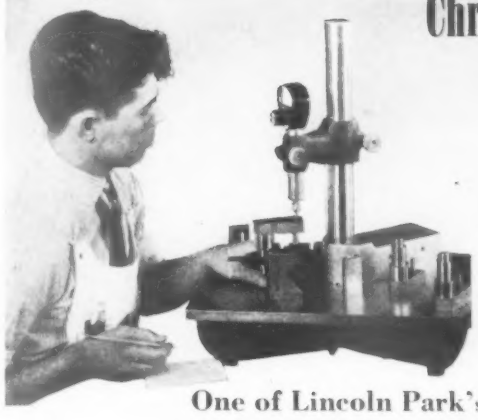

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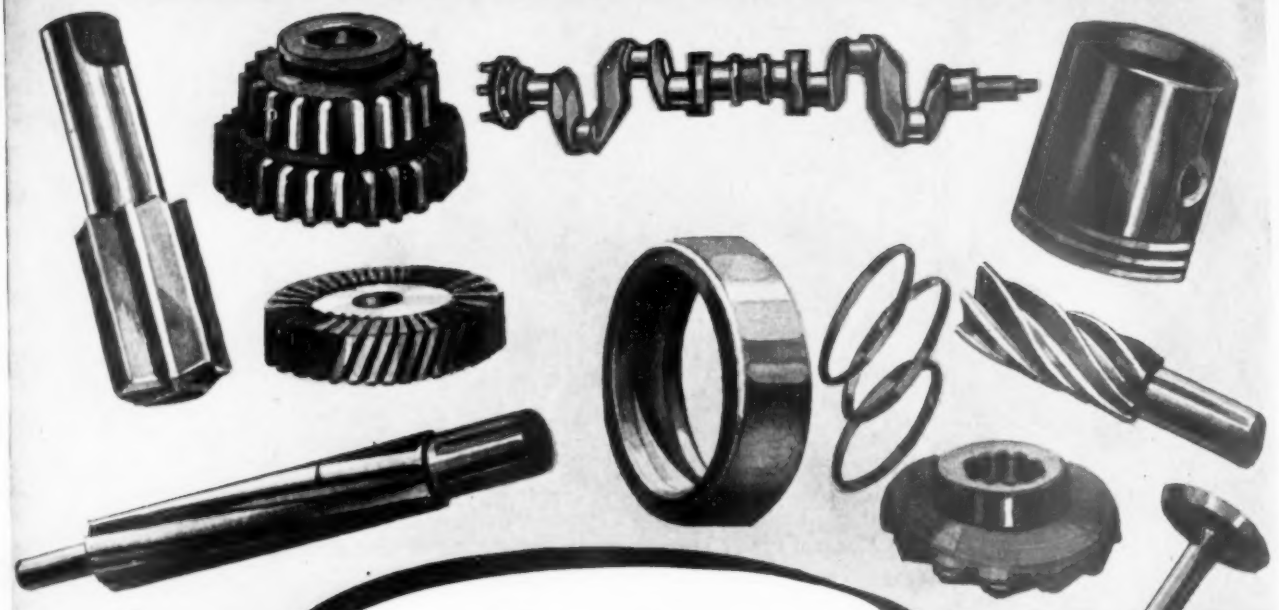

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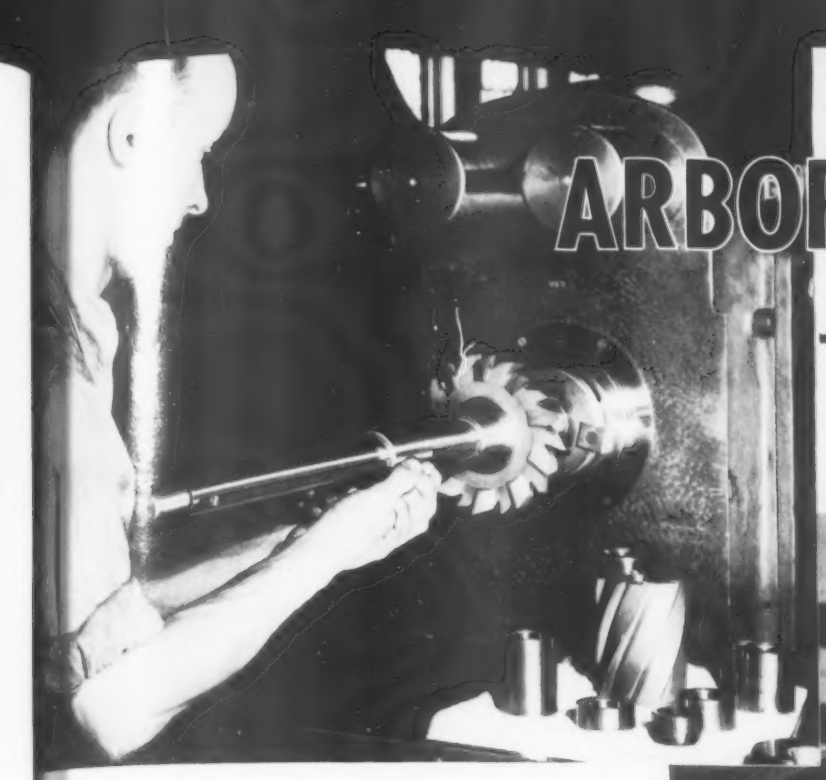

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BE SURE arbor is well supported and of ample diameter.

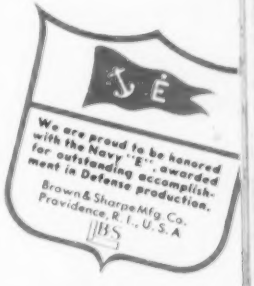
ALWAYS use a cutter driving key to prevent slippage and consequent damage to cutter, arbor, or work.

Except on very short arbors and those of Shell End Mill type, **DO NOT TIGHTEN** the arbor nut until the arbor is supported by a yoke. Such abuse results in distorted arbors.

BE CAREFUL not to run the work or some part of the machine into an arbor. Such action may spring it and cause damage to cutting tools.

WHEN NOT IN USE, arbors should be kept in racks where they may be found easily and not subject to injury from other heavy or sharp tools.

Your conservation of arbors will help you do more and better work and will result in increased cutter efficiency and longer machine life. It's **another** way to help in the united war effort.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